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MASHERBRUM, 1938

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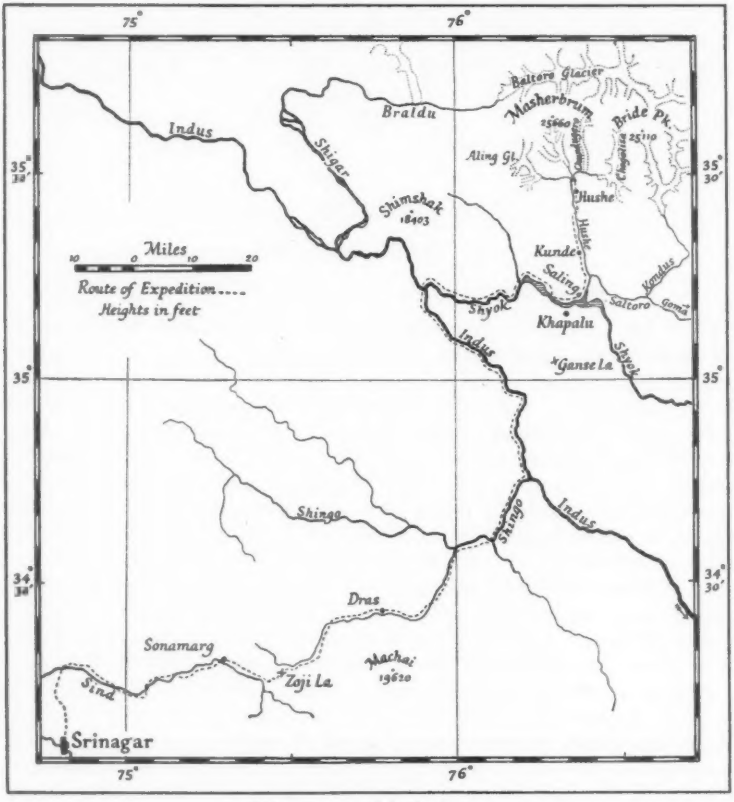
THE left bank of the great Baltoro glacier in the Eastern Karakoram is bounded by a high mountain chain which runs east and west and forms the northern edge of an irregular quadrilateral of lesser ranges and peaks. From this backbone, and at about the centre of the main trunk of the Baltoro glacier, rises Masherbrum (25,600 feet), whilst the eastern end of the chain carries Chogolisa[1] (25,110 feet) near the confluence of the Baltoro tributary glaciers and at about 15 miles from Masherbrum. The quadrilateral itself consists of long subsidiary ridges which in general extend far to the south, but with many complications. Its drainage to the north is by relatively short subsidiary glaciers into the trunk of the Baltoro glacier, and to the south it drains by complicated glacier systems which collect into long valleys and discharge nearly due south into the Kondus and Shyok rivers; the unexplored north-west segment of the mass seems to drain in that direction by at least one long glacier, the stream from which joins that of the Baltoro.

Save for a tentative exploration from the Baltoro side by Bruce and Conway in 1892, the forbidding northern precipices of Masherbrum have been left alone, but several travellers have explored its southern glaciers. From the mountain a lower ridge runs nearly due south for about 10 miles and separates the Masherbrum glacier on the west from the Chundugero glacier on the east, the combined streams from the latter and from the Chogolisa glacier still farther to the east running under the termination of the ridge to join those from the Masherbrum glacier and from the Aling glacier farther to the west. The combined streams then flow due south past Hushe village and down the Hushe valley, to discharge into the Shyok river at a point about 32 miles south of Masherbrum. All four of these glaciers have been previously visited.

The first traveller to reach these glaciers seems to have been Godwin-

[1] The Karakoram Conference Report recommends Chogolisa in preference to Bride Peak (*Geogr. J.* 91 (1938) 150).

Austen,[1] who penetrated the Masherbrum and Chundugero glaciers in 1860 for about half their lengths, but published little description of them. On the authority of Dr. Hunter Workman, Mr. Sillem, a Dutchman, ascended the Masherbrum glacier in 1903, when he thought that he saw a way thence over the main ridge, but was prevented from attempting it. He apparently published no account of his exploration before his untimely death in the Alps two



The route to Masherbrum

years later. Dr. Workman himself,[2] accompanied by his wife, explored all four glaciers in 1911, probably ascending the Masherbrum glacier for about half its length and certainly penetrating the eastern head of the Chundugero glacier. Since 1911 the glaciers have been left in peace save by the hillmen who graze their cattle during the summer months in the lateral troughs of the glaciers and on the lower bounding slopes above them, and by occasional

[1] *Journal R.G.S.* 37 (1864) 20.
[2] 'Two summers in the ice wilds of Eastern Karakoram.' London, 1917.

sportsmen, to whom the Hushe valley and its side glens are notable hunting grounds. No serious mountaineering party however had visited the district before 1938.

It was with the intention of exploring Masherbrum from the south, and, if possible, of climbing the mountain, that a small and informal party left Srinagar at the end of April 1938. Captain J. Harrison, Mr. R. A. Hodgkin, Lieutenant J. Waller, and the writer set out on April 28, whilst Lieutenant J. O. M. Roberts followed us by forced marches a few days later. With us were five Sherpa porters of good experience, and Roberts brought with him two less experienced Gurkhas from his battalion. Our route took the usual way across the Zoji La, snow lying more or less continuously from below the Sonamarg gorge to beyond Dras, four marches later. The winter of these 40 miles or so of snow was dramatically succeeded by spring and apricot blossoms as we descended the Shingo river, and we had almost entered a climate of early summer in the Indus valley when we had to leave it to strike east up the Shyok. Two forced marches then landed us at Saling, a little above Khapalu, on May 13. Here, near the confluence of the Hushe river with the Shyok, we paused for a day, and Harrison left us for a time in order to go up the Saltoro valley to collect some hillmen from Goma as porters. The rest of us then turned up the Hushe valley.

This valley is about 15 miles in length from its mouth to Hushe village, and it runs almost due north and south without bend. About 3 miles above the village, the valley is prolonged to the north by the glen of the Masherbrum glacier but at a slight angle, whilst another branch of the valley turns to the east towards the snouts of the Chundugero and Chogolisa glaciers. At its southern end, the east side of the valley is formed by the fine and broken mass of the Saltoro peaks. Higher up the valley soon constricts, and its flanks are too precipitous to allow their culminating summits to be seen, but side glens give fascinating glimpses of fantastic granite mountains. These glens have washed down great masses of moraine matter into the main valley, and through these the river has cut deep gorges. As you ascend it, the walls of the valley close in, becoming ever steeper and eventually consisting of bare precipices on the east side. Above Hushe village, these precipices are set at a very sheer angle, yet their great and seemingly unfissured faces are nevertheless adorned by dwarf trees in the incredible manner noticed by Dr. Workman. In places, and particularly at the mouth of the Aling glen, there are curious formations of water-sculptured clay, and in the main valley the extremely rough track, which in places is exposed to the danger of stone fall, affords fine views of the glacier stream flowing in the canyons which it has forced through the old glacial deposits. We ascended this valley in two marches, reached Hushe village on May 16, and pitched our first base camp about 2 miles above it on a pleasant flat by the east bank of the river.

The approaches to Masherbrum had now to be explored. The Masherbrum and Chundugero glaciers obviously offered access to the south-west and south-east flanks of the mountain respectively, whilst the Aling glacier, although not so mapped, might nevertheless give a way to its west face. With regard to such possibilities, the only information which we had was obtained from a photograph of the south-west aspect of Masherbrum taken by the

Workmans,[1] which seemed to show that a climbing route might possibly be made on that side from the Masherbrum glacier. One of the finest features of the Hushe valley had been the sight of Masherbrum rising at its head, and a particularly fine view of the mountain had been obtained in the early morning from Kunde at a distance of a little more than 23 miles. This had shown the twin summits nearly in line and separated from a lower eastern summit by a high *névé* basin. From the main summits, a ridge had descended towards us, and their east and west ridges had been seen in profile, the former bounding a very steep east face which fell into the high basin. We had now a magnificent view of the mountain from our tent doors at the base camp, framed between the great rock pillars which stand on either side of the mouth of the Masherbrum glen, but the eastern parts of the mass were hidden.

The west ridge was obviously impracticable as a route to the summit by reason of the unbroken character and steepness of its rock, although doubtless it was climbable in a technical sense. The east ridge, which falls to a col at about 23,500 feet between the main summits and the lower one to the east, appeared also to be impracticable for the same reason. We had not yet obtained a facing view of the east face, but the steepness of its snow had shown that it would probably be dangerous save perhaps in long continued good weather. The south ridge apparently offered the safest route to the summit, could it be attained, but it ended abruptly in a great rock tower. The ridge might perhaps be reached above the tower by the ascent of its flank from the high *névé* basin, the way to which had therefore to be explored. It seemed to be possible that a practicable route to the upper basin might lead up either from the Masherbrum or from the Chundugero glacier (it actually discharges into both), or perhaps even through the col at its head.

We accordingly decided in the first instance to explore the Masherbrum glacier during Harrison's absence, and set out to do so on May 18, pitching camp that day at 13,300 feet in the right lateral trough of the glacier, a few hundred yards short of some primitive summer huts, the roofs of which just showed in the snow. On the following day we all ascended the glacier to a point not far distant from our camp, where a subsidiary glacier entered from the west. Here Waller and I decided to ascend the main glacier to its head in order to examine a side glacier which offered a possible access to Masherbrum and to see the south arête from the side, whilst Hodgkin and Roberts went off up the flank on our left to obtain a good view of the mountain from the south-west.

The Workmans camped in 1911 at a place which must have been near the site of our own camp. Thence, after an intermediate camp from which they obtained the photograph of the south-west face of Masherbrum referred to above, they ascended a point above the flank of the glacier which they named "Quartzite Peak" (16,839 feet). This they mapped as lying on the bounding ridge above the head of the glacier and a little north of due west from the summit of Masherbrum, although a glimpse of the latter in their summit photograph shows that their own peak was on nearly the same bearing as their higher camp, and really lay more south than south-west from Masherbrum, as seems also to be indicated by the context. In other words, Quartzite

[1] *Op. cit.* Illustration facing p. 80.

Peak is a subsidiary point on a subsidiary ridge which falls from a beautiful snow peak on the west side of the glacier, and it crowns the flank immediately above our and their camp, as was now clearly evident. Hodgkin and Roberts had this point as their objective, but in the month of May that flank is laden with deep and soft snow over what, later in the year, is steep vegetation. Under such conditions the complete ascent was impossible, but they obtained a fine view of Masherbrum almost identical with that reproduced in the Workmans' book.

Views from that angle however do not tell us much about the side glacier of access, which is well seen during the farther ascent of the main glacier. As we went up, we had fine views of the beautiful snow peak on our left, the fluted and very steep pyramid of which rises to about 21,000 feet. This peak was wonderfully displayed from the lower camps on Masherbrum during our actual climb, and we called it the "White Sail" amongst ourselves—a happy invention of Roberts's. The deep and treacherous soft snow on the glacier made our way difficult in places, but soon we came level with the side glacier of possible access, and examined it and its northern bounding ridge, the latter obviously offering no practical route. From the upper basin of Masherbrum, an ice-fall discharges on to a high and large plateau, part of which (the "Dome") crowns the upper portion of the north bounding ridge of the side glacier and discharges in its turn into the high terminal basin of that glacier. From this, the side glacier descends abruptly in broken steps, but it was now clear that a route of ascent could possibly be made up the south (true left) edge of the glacier, and on the lower slopes of that bounding flank, although the way might be exposed to avalanche danger under bad conditions.

Continuing our way, we reached the head of the main glacier, there to have a magnificent view of the semicircle of cliffs which encloses it. Our elevation here was about 14,300 feet. The rim above us stretched nearly horizontally round from the base of the upper cone of Masherbrum at a mean elevation of about 21,000 feet. The flank between rim and glacier fell through its 6000 feet or more almost vertically as it seemed, and actually at an angle which must have exceeded 35° and in some segments was much steeper. It was composed of steep and shallow rock ribs, now laden with snow, between which were suspended innumerable hanging glaciers. On the west side of the semicircle a remarkable rock tower rose from the actual rim, and on the east side was Masherbrum. We could now see the south ridge from the side. It was long, and it rose in steps. And not only did the steps appear practicable, but it looked as if there might be camp sites at one or two more level places. From the great rock tower which terminates this ridge at a high elevation (or rather, from the south ridge just north of it), a subsidiary ridge runs down to the west for a comparatively short distance, when it terminates abruptly. South of this lies the high snow plateau which rises to the Dome at its own south edge, and falls between rock and Dome to a wide and shallow trough. This, we could now see, breaks away into ice-cliffs by which, at the level of the rim, it discharges steeply down on to the Masherbrum glacier. Having enjoyed this fine view for a time, and having discovered all that was to be seen from the glacier itself, we then returned to our camp.

The Aling glacier was still a closed book, although even should it provide a

way to the rim at the head of the Masherbrum glacier and thence to the west face or ridge of the mountain (it does not do so), neither face nor ridge would be a practicable route to the summit. Closed books however excite the curious, and just below our glacier camp there entered from the west a wide side glen, up which we had seen a practicable col which would lead over towards the Aling glacier. Waller wished to return to the base camp, but we thought that we still had a day or two before Harrison should rejoin us, and, having brought up sufficient food for these days, this col seemed to offer a more interesting adventure to the rest of the party than would our original intention of exploring the Aling glacier from its mouth.

On May 20, Waller therefore returned to the base camp whilst Hodgkin, Roberts, and myself ascended the side glen with three Sherpas. The glacier was easy, as also was the flank of the col, save for its steepness and the soft state of the snow. There, probably at about 16,000 feet, we arrived to have a fine and wide view. In the north-east Chogolisa was prominent, and to the left of it high distant mountains, probably Broad Peak and Gasherbrum, could be seen. There was a great tangle of nearer ridges, those above, between, and beyond the Chundugero and Chogolisa glaciers, and farthest to our right we could see a very distant peak which at the time we thought might be K36, although this I now doubt. Our view to the south was more picturesque and more restricted. No very high summits were visible, but we could see peaks of fine shapes across where must lie the Aling glacier.

To attain this we left the col and descended an easy glacier, some ice-steps having to be cut when we came to its snout. Below that the glen closed in on us until its floor became a narrow ribbon of snow between nearly vertical cliffs and barely 20 feet wide. Then the stream under the snow plunged down in a high waterfall, at the side of which there was no possible way of descent, and it was clear that we must bivouac for the night if a place could be found. Going back up the gully we were exceedingly fortunate to find such a place high on its left flank where a narrow neck joined a high rock to the hillside. Having reached this, the Sherpas started building operations whilst Hodgkin and Roberts tried to explore a way down on the far side of the rock and I went up the flank behind it to see if a traverse might be made with subsequent descent to the Aling glacier. Both ways of descent proved to be impossible, but I had a magnificent view of the Aling glacier basin and its precipitous peaks from the shoulder above the bivouac. Two almost equal glacier trunks united beneath us, both greatly broken. The right-hand branch curved round to the north-east out of sight just above where it was joined by a large affluent from the west, which might possibly provide a route in that direction. The size of the main stream did not suggest that it arose from anywhere near the watershed of the Baltoro glacier, and its head is probably enclosed by a ridge which seems to join the White Sail (21,000 feet) to another peak of slightly greater elevation to the west of it.

We left our pleasant bivouac next morning to retrace our steps over the col and to reach our base camp above Hushe by way of the Masherbrum glacier. There we found that Harrison had been able to collect the Goma men much more quickly than had been expected and, returning during our absence, had visited the lower part of the Chundugero glacier. The upper parts of this

Masherbrum from the south

The view north-east from the col between the Masherbrum and Aling glaciers

glacier had however still to be explored for our purposes, and it was decided that, to save time, Harrison and Hodgkin should find a way up the affluent of access from the Masherbrum glacier whilst the remaining three of us went to see whether there was a better way to the upper basin from the east. Both parties were to return to the base camp in six days' time.

Roberts, Waller, and myself therefore set out on May 22 to explore the Chundugero glacier. A rough track runs along the left bank of the Hushe river nearly due east from the base camp to a point level with the snout of the glacier. Here the south enclosing flank continues in the same easterly direction to become that of the Chogolisa glacier, whilst the Chundugero glacier nearly impinges against it at right-angles, its terminal moraines being separated from the cliff merely by the width of the glacier stream. Turning north up the eastern edge of the moraines we soon reached a definite left lateral moraine from which we had a good view up the Chogolisa glacier, the snout of which was not far distant. The high peaks at the head of the glacier were unfortunately in cloud. Continuing up our moraine, we finally pitched camp that day at 12,475 feet.

Masherbrum also had been in cloud all that day, but we obtained a fine and clear view of it next morning. The right-hand (north or north-east) skyline of the terminal mass fell almost vertically and suggested an equal steepness of its north face. Going on up the left moraines and flanks of the glacier we finally pitched our second camp at 13,800 feet, not far below a point where the axis of the glacier bends to the east or north-east round a corner. Whilst camp was being made, we continued upwards for another hour or so in order to see what we could of this origin of the glacier. Then we returned to our camp, which was beautifully set beside a lake between the lateral moraine and the flanks above, amidst surroundings as fine as any I have met.

The summit of Masherbrum was never free from cloud whilst we were here, but the greater part of its eastern flanks was visible, and it was now clear that no practicable route could lead to the upper basin from this side, unless a way could be made from the north-east through the col at its head. We could see that the upper basin discharges on both sides of the subsidiary ridge which runs south from Masherbrum. On the west some of its ice falls by way of the high plateau directly on to the Masherbrum glacier, whilst some of it reaches that glacier less directly by way of the side glacier upon which the other party was now engaged. On the east the ice from the upper basin falls over cliffs into a high collecting basin, the ice-fall from which is of great breadth, though forming only a part of one of the most amazing ice-falls which I have ever seen. Broad ice-streams from at least four great gathering basins or glaciers break into ice-falls high above the main glacier and converge, coming as it were shoulder to shoulder without trace of intervening moraines. The whole blends into an ice-fall of great steepness and height, but the latter (perhaps not far short of 3000 feet) is almost dwarfed by the great breadth of the system.

A long and broken subsidiary ridge descends to the east from the lower east peak of Masherbrum, and terminates in a fine rock peak almost the shape of the Matterhorn. As far as we could see, the most northerly component of the great ice-fall arises from a high glacier which may possibly sweep round this peak

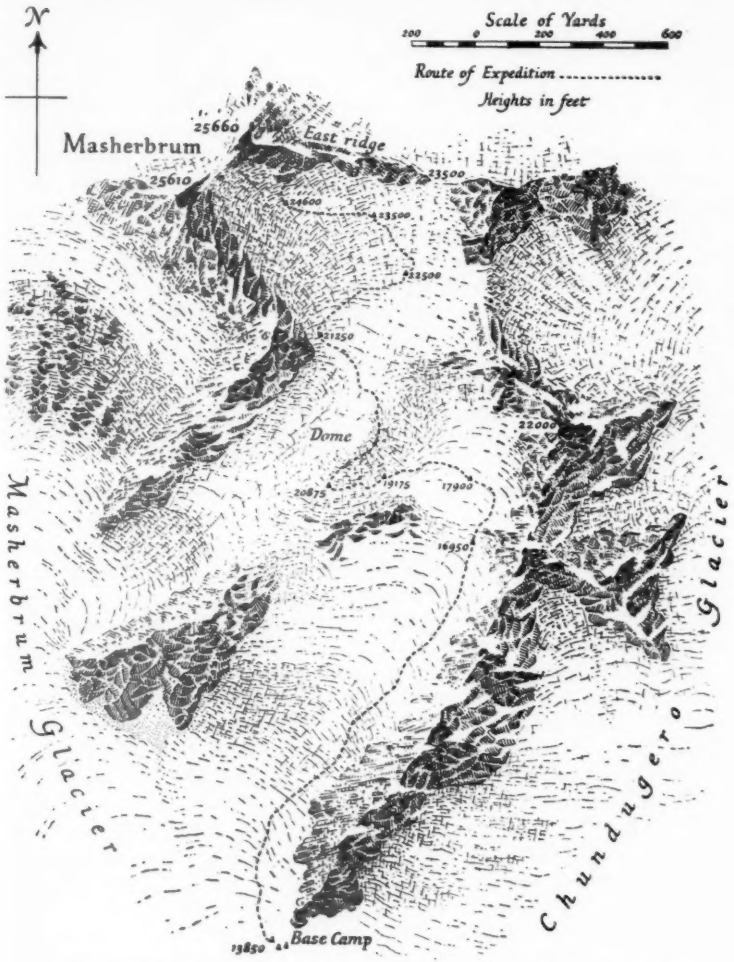
from the north-west. If so, and were it possible to ascend the ice-fall, this glacier might offer a way round to the col at the head of the upper basin. These improbabilities attracted Roberts and myself, and an alternative route to the upper basin might be useful, but as attractive as anything was the possibility that we might see the great north face of Masherbrum; and there still remained four days of our time for further exploration and return. Waller however was rightly satisfied that any attempt on Masherbrum from the east would be a forlorn hope should the other route fail, and resolved to return to the base camp, whilst Roberts and I agreed to give two days only to the problematical exploration.

Waller accordingly left on May 24 to descend to the base camp while Roberts and I set out with two Sherpas and two days' food. Having crossed the Chundugero glacier, we ascended an intricate fault in the ice-fall between its most southerly components and the more mingled mass of the others, so reaching the foot of the rocks of one ridge of the smaller third peak of Masherbrum at an elevation of 14,750 feet. Here we had overcome perhaps one-third of the height of the ice-fall, and we now had to ascend into its more northerly parts. As below, the séracs were covered with much snow which masked the smaller crevasses, sometimes completely, and it was very difficult to find a practicable route. After one more considerable failure however we struck a successful line which carried us upwards across the middle of the fall to a partial easement, above which it again rose steeply. Going on, snow began to fall and then thickened, so that it became certain that we could not overcome the ice-fall that day, nor was there any possible bivouac place above us. We therefore descended to where some ice hummocks offered what appeared to be a safe site for a bivouac at 15,325 feet. During a transient clearing of the weather we later had a view down the Chundugero glacier to the peaks on the eastern watershed of the Hushe valley, one at least of which appeared to be of considerable height. There was a fine peak on the opposite side of the Chundugero glacier above its bend. But if any higher peaks should have been visible they were hidden in cloud.

Snow fell during the night and was still falling in the early morning of May 25, so delaying our start. As we now had food for that day only, we had neither margin of safety nor time to explore the upper glacier even were it possible to surmount the intervening ice-fall and had the weather been settled. We therefore were compelled to descend in our tracks, which were for the most part obliterated, and so regained our camp by the glacier. On the way we had a fine view up the north-east branch of the Chundugero glacier, the axis of which proved to bear 67·5° (70° magnetic). The peaks on its north bounding ridge were not impressive, and at least one considerable affluent coming in from them seemed to suggest a possible pass over to a corresponding affluent of the Baltoro glacier. The head of the glacier appears to be enclosed by a steep wall much as is that of the Masherbrum glacier, but probably of lesser vertical height, and does not seem to offer a practicable pass for a laden party, at least by inspection from a distance. The peaks of the south side of the glacier are more impressive. Many steep glaciers fall from them, and there is at least one large collecting basin on that side.

On May 26 Roberts and I descended again to the base camp, to which

Harrison and Hodgkin also returned. They had found a practicable way up the true left edge of the side glacier and had penetrated its collecting basin, an excellent and valuable piece of work. We accordingly decided to adopt that



Route up Masherbrum followed by Professor Graham Brown's party

as our route towards the upper basin. After a day at the base camp we struck it and in two marches shifted everything to a new advanced base camp at 13,850 feet on the left lateral moraine of the Masherbrum glacier and about one hour or a little more below the confluence of our side glacier of access.

Our attempt on Masherbrum commenced on May 30 and lasted a little

more than three weeks. During this time we had uniformly unsettled weather, snow falling at one time or another on most of the days, and movement being prevented on several occasions. Distant views were very rare. Our first camp was made at 16,950 feet, a little less than 1000 feet below the head basin of the side glacier, to which it was moved later on (17,900 feet). The north side of this basin rose in a steep snow flank to the Dome, and our second camp was set some way up the flank at 19,175 feet. Our third camp (20,875 feet) was at the top of the flank not far below the summit of the Dome. From it the broad and slightly ascending high plateau led to the foot of the ice-fall from the upper basin, and we made our fourth camp at 21,250 feet just below the left-hand end of the ice-fall near the foot of an ascending corridor between it and the base of the great tower.

On one occasion we had a partially clear view from this camp to the south and south-west. The Hushe valley lay straight as an arrow before us in the former direction, and we could see the sands of the Shyok beyond the mouth of the Hushe river, with the Ganse La beyond that again but to the right. The great mass of summits between the Hushe and Kondus valleys was only seen in part, but it seemed to be much more complicated than might appear from the map. West of K27 (which was nearly completely in cloud) there was a lower but still high peak, and north of that was a fine cone which was identifiable as one which we had seen to ascend from not far above the snout of the Chogolisa glacier on its south side.

The view to the south-west was one of great interest, but it was unfortunately more obscured by clouds. The southern watershed ridge of the Baltoro glacier ran west by south-west, carrying at least one considerable peak (apparently higher than 21,000 feet), beyond the watershed of the Masherbrum glacier. We could look over the rim of the head of the glacier on to a cloud-masked tangle of lesser ridges which descended north or north-west to the Baltoro glacier. Parallel to the Baltoro watershed on its southern side was a chain of abrupt and fantastic peaks, apparently of elevations between 20,000 feet and 21,000 feet, which culminated at the near end in a higher summit. This latter seemed to be joined to the slightly lower (and nearer) White Sail, now seen to be nearly exactly 21,000 feet in elevation, by a depressed ridge which probably separates the head of the Aling glacier from that of a long glacier which runs to the west or south-west between the Baltoro watershed and the parallel ridge. On the far side of the Aling basin was another mass of lower peaks, many of them finely moulded, and amongst these must have been the one triangulated point (21,190 feet) of this area, now unfortunately buried in cloud.

Up to this camp various combinations of us had pioneered different segments of the route, and from it three of us penetrated the upper basin on June 12. The east flank of the south ridge of the culminating mass as well as the east face of the latter had been examined from a distance during our exploration of the Chundugero glacier, but we had seen nothing of either during the climb save unsatisfactory glimpses of the face in profile. Both should of course have been visible from the upper basin, but visibility that day was limited to a few feet and no view was obtained. The following day was one of blizzard, and during it we decided that our next move would be an

Masherbrum from the Chundugero glacier, showing the highest point reached (A)

The snout of the Chundugero glacier looking north-east

The east face of Masherbrum, showing highest point reached (A) and site of Camp VII (B)

The White Sail from Masherbrum glacier

Property of the Library, Hampton Institute, Hampton, Virginia

attempt by Harrison and Hodgkin with two Sherpas to reach the south arête from the upper basin whilst stores were being brought up from Camp III and a fifth camp was being established and well stocked in the upper basin itself. These two accordingly set out on June 14 and pitched their camp in the upper basin in weather too thick to see their surroundings. During a second day of snow and mist, the last of seven consecutive days of snowfall, partial or complete, they traversed the upper basin to near its north end, there pitching Camp VI at about 23,500 feet. On the following day, June 16, the remainder of the party finally established Camp V in the upper basin at about 22,500 feet, or perhaps a little higher.

That day was at last clear and sunny, so that for the first time the east face of the summit cone could be properly seen. It was a snow-face which rose in its lower part at a moderate angle from the basin but then steepened very greatly towards the top and above the level of a great ice-cliff, which ran across its right-hand or north half to above some rocks on the flank of the east arête. So brilliant did the weather appear to be, that Harrison and Hodgkin resolved to try to reach the actual summit after pitching another camp that night in the middle of the face at an elevation of 24,600 feet (by aneroid, which probably read much too high). From this they sent back the Sherpa, who reached the lower camp in an hour, and on the morning of June 17 they traversed across the face under the ice-cliff to the rocks mentioned above, by which they hoped to reach the east arête and thence the summit. The rocks however were snow-clad and proved more difficult than they had promised to be, the difficulties being increased by a very cold wind. Frost-bitten fingers and the conditions soon prevented any further attempt to surmount the rocks, and the pair returned to their camp at about midday. The weather thereafter rapidly deteriorated, and a small avalanche early on the morning of June 18 buried the tent very nearly completely. They were fortunately able to extricate themselves and their bedding, and then decided to abandon the tent and descend to Camp VI, to which Waller had gone with all the remaining Sherpas on the previous day. Visibility was extremely bad again, and Harrison and Hodgkin lost their bearings when actually not very far from Camp VI, then deciding to get into their sleeping bags in the shelter of a crevasse. Thence they shouted for help, and Waller went out with four Sherpas to try to find them. But when he had proceeded for about two or three ropes' lengths, Waller realized that there was grave risk of losing both bearings and track were he to continue, so endangering his party. He therefore turned back at about 5 p.m.

On the following morning the weather fortunately cleared sufficiently for Harrison and Hodgkin to see Camp VI, to which they descended. That camp was then immediately evacuated, all collecting at Camp V. Harrison and Hodgkin's additional exposure had resulted in frost-bitten feet in addition to the frost-bitten fingers sustained on the day of their climb, and the attempt on Masherbrum had to be abandoned. The descent to the camp on Masherbrum glacier occupied three days, and the camp above Hushe village was reached on June 23.

DISCUSSION

Before the paper the CHAIRMAN (Professor KENNETH MASON) said: This evening we have as our lecturer Professor Graham Brown, Professor of Physiology at Cardiff, whose subject is the Masherbrum Expedition. Masherbrum is one of the high mountains of the Karakoram. Professor Graham Brown was a member of that expedition. It did not, I believe, have a leader, but he was undoubtedly the most experienced member.

Professor Graham Brown then delivered the lecture printed above, and a discussion followed.

The CHAIRMAN: Will Mr. R. A. Hodgkin say a few words?

Mr. R. A. HODGKIN: I very much hope every one has enjoyed listening to Professor Graham Brown as much as I have. It has been a great pleasure to go over the ground once more. I could certainly go over it in reality many times without ever getting tired of the wonderful country in which we travelled.

Perhaps it might be of interest if I add a few words with regard to our actual experience above Camp IV towards the summit of the mountain. Harrison and I left Camp IV ahead of the others, who were following us up the mountain, stocking camps and acting in support. As Professor Graham Brown has told you, we pitched Camp V in the basin, pushed on into the doubtful weather, pitched Camp VI and awoke next morning to find, instead of the poor weather and blowing snow we had expected, a most magnificent day which offered us the chance, if not of attaining the summit, at least of getting some idea of the most suitable route up it. We pushed on up the steep snow-slopes. We were feeling quite fit and were well acclimatized. In spite of the altitude we probably felt rather more exhilarated than is usual at that height because we were getting our first clear view for many days and seeing landmarks, only too familiar by their altitude above us, sinking to our level and then below it. We pitched Camp VII on a site which seemed to us a gift from heaven: on the mountainward side of a small snow and ice pinnacle which stood well out from the face and which seemed to offer both an easily levelled patch of ground and a place that would be safe from any large avalanche from the main face. But things happened otherwise.

Next day was another fine one. After several hours' climbing in soft snow and on the east ridge our fingers became slightly frost-bitten. Having reached 25,000 feet we returned to Camp VII, and spent several hours rubbing our fingers to restore circulation. We went to sleep that night listening to a gathering storm, but little dismayed, because we had several days' food and knew we could probably stay up there if there was bad weather. At about 5 o'clock the following morning we were rudely awakened by that most disturbing of sounds in the Himalaya, the noise of an avalanche. We did not know whether it was a big one, or whether it was far away or nearby; but we were not left long in doubt. It was soon on top of us, pressing in all round, pushing in the side of the tent, so that we thought the end had come. However it had not. We burrowed our way outside and looked round, and saw that the snow which had collected on the small pinnacle which we regarded as our guardian angel had slipped down and buried our camp up to the level of the top. Apart from our inclination not to stay in a place where an avalanche had fallen, the camp was now uninhabitable. Having extricated our most essential belongings, except for one ice-axe, we started down for Camp VI in not very bad weather. However it soon became very bad and any progress became extremely difficult. For a long time we struggled down the slope, but were

eventually forced to seek shelter in a small crevasse. It was not much of a refuge because it did not keep the draught out, and having got into vocal communication of a sort with the camp below, we later decided to have another shot at getting down at all costs. We struggled on down a little farther.

All this time we were getting more and more frost-bitten. By about 6 o'clock it was getting dark and we realized that in all events we must get out of the wind before nightfall, even if we could not reach the camp we were struggling towards. We never lost our way, though we were not certain where we were; we were in fact never off the route that we ascended, but we were never absolutely certain that we were on it. As you have heard we did not get down to Camp VI. Instead we went down another hospitable crevasse where we found a small snow platform on which we spent the night, comparatively warm in our sleeping bags and out of the wind. The chief discomfort was occasional lumps of snow which would fall down and nestle in the mouths of our sleeping bags. The night passed fairly quickly. Next morning we set off again and, after going down about 100 yards, much to our relief we saw Camp VI half buried in the snow not very far down the slope. We got down safely, but I am sorry to say that as a result of our frost-bite and that of one or two other members of the party it was obvious we could not prolong the attack any longer, so final descent was the only possibility.

There seems to be little doubt that Masherbrum could be climbed, but it would be difficult under any circumstances. Captain Harrison and I both agree in thinking that the east face would probably be the quickest route to the top. Though the south ridge would be less laborious and possibly safer, it would be a roundabout approach and would involve traversing the south lower summit before the true summit could be gained. Our attempt by the east ridge seems to suggest that its angle and general difficulty would discount any advantage it might gain from its directness.

It had been a wonderful time, and even the journey back, although we were disappointed and sometimes anxious, was enjoyable in its way, travelling with such pleasant companions and in such truly wonderful scenery.

Dr. T. G. LONGSTAFF: We are honoured this evening because Professor Graham Brown is one of the most prominent members of the Alpine Club. He has made a name for himself by specializing in the ascents of the longest and most difficult ice-slopes in the Alps, particularly in new routes on the Italian side of Mont Blanc. Robin Hodgkin is also a most distinguished mountaineer. In 1937, in the course of an expedition to the Caucasus, he made a very difficult new ascent of Ushba, the double-headed Matterhorn of that magnificent range, besides several other ascents of the first order. The Masherbrum Expedition was organized by Lieutenant James Waller, R.A., now on his way back from India.

It is very hard luck that no member of the party reached the summit. As you have seen, it is difficult enough to get even to the foot of the final peak. Those great snow-slopes are much steeper than appears from the photographs. My experience is that in the Alps snow- and ice-slopes look steeper than they really are; in the Caucasus they are about as steep as they look; but in the Himalaya, almost invariably, snow- and ice-slopes turn out to be much steeper than their appearance leads the alpine climber to expect. Under the bad snow conditions it is remarkable that Captain Jack Harrison and Robin Hodgkin should have climbed to 25,000 feet. That they survived the storm which caught them, and managed to get down alive, is a great testimony to their skill and resolution. It is only men of the finest fibre who can persevere at these altitudes, when physical and mental resistance is reduced to a very low ebb by oxygen starvation.

To us, as a geographical society, the glaciers of the upper Hushe valley are topographically new ground. In the '60's Godwin-Austen visited the valley, and the Workmans have been on two glaciers. The late Mr. Sillem, a Dutchman, also visited the upper glens, but unfortunately left us no record. So Waller's party broke new ground on the exploration of these complicated glaciers, and I think that a meeting of this Society is quite the proper place to hear a mountaineering tale which includes so much true exploration. We are all very grateful to Professor Graham Brown for so excellent a lecture illustrated by such beautiful lantern slides.

Mr. ERIC SHIPTON: In the first place, I should like to thank Professor Graham Brown for the wonderful photographs he has shown us. I know something of that interesting country and like it very much indeed. I assure you that nothing short of going back there could have brought it to me as his slides have done. In particular the photographs of the Indus were really beautiful and succeeded in capturing in a remarkable way the atmosphere of the country.

The expedition itself was very different from most mountaineering expeditions that we hear of in this hall; principally in that it was an attempt to climb a mountain that had not previously been reconnoitred. The tackling of a mountain on the scale of Masherbrum or of any of the other great Himalayan giants without previous reconnaissance was a courageous effort. I knew even before this evening that the approaches to this mountain are extremely difficult. The photographs have probably now made that quite evident to every one present.

The country is extraordinarily complicated. There are countless valleys, which are minor nullahs in the Himalaya but which would be looked upon as major valleys in the Alps, that were quite unexplored. Nobody knew before the climbers went up them what lay at their heads nor whether there was a possible route. Each of these valleys had to be explored by the party before a route could be found. Thus it was remarkable that they could not only get on to the mountain and find a good way up it but that they got so high. It is pleasant to hear of an expedition which recalls the classic days when Dr. Longstaff and others were combining mountain exploration with mountain climbing. As Dr. Longstaff has pointed out, the whole of the southern side of Masherbrum is really, geographically speaking, new ground. There are no decent maps of it, and, if I may venture a criticism, I think it is a great pity that a surveyor did not accompany the expedition to make a map of the ground covered and explored. Surely this was an opportunity wasted.

From every other point of view I would like to congratulate Professor Graham Brown, Mr. Hodgkin, and other members of the party on a fine performance. I need not tell you that both of them have made ridiculously light not only of the difficulties but of the hardships they underwent.

The CHAIRMAN: I am now going to shirk one of my duties. The photographs we have seen were so magnificent that I feel I must ask Sir Francis Younghusband to propose the vote of thanks. Sir Francis Younghusband knows more about the Himalaya and their aesthetic side than any one else. He will be able to do justice to the proposition.

Sir FRANCIS YOUNGHUSBAND: I do with the very greatest pleasure propose a vote of thanks to the lecturer, for he has given us an excellent example of the kind of lecture we in this Society would like to have in the future. Most of the great exploration has been done. Rough outlines have been made. Now has come the time for parties like that which went to Masherbrum to supply the detail, and thus finish off what remains of exploration. Then, we may hope, they would come back to this Society and, in such perfect language and with

such beautiful slides as we have just heard and seen, give us an impression of what they have observed.

I have hitherto criticized photographs of the Himalaya. They have always seemed to me to reduce the magnitude and impair the tremendous impression which the great peaks make upon us as we travel amongst them. But this evening there has been an exception. The lecturer seems to have taken the most perfect photographs and exhibited them in such a way that we have got an impression of the tremendous height, the great variety, and the rugged grandeur of the Himalaya giants. That is a great thing to have done. So I do most sincerely propose a hearty vote of thanks to Professor Graham Brown, and hope we may have many more lectures like his in this hall.

The CHAIRMAN: You will not wish me to add anything further. You have expressed your thanks to the lecturer in no uncertain manner.

Note on the sketch-map of the route up Masherbrum

The party had no surveyor. The sketch-map of Masherbrum and its immediate surroundings, on p. 89, is from a drawing made by Professor Mason from photographs and constructions based upon them by Professor Graham Brown; the original sketch was modified in detail by suggestions from members of the party. There is no material for a map of greater extent to show the reconnaissances made by sections of the party east and west of the main line of approach.

PLANS FOR A NATIONAL ATLAS

Discussion opened by PROFESSOR E. G. R. TAYLOR

Meeting of the Society, 4 December 1939

THE suggestion that the time was ripe for the publication of a National Atlas of Great Britain and Northern Ireland was first made at the meeting of the British Association held at Cambridge in 1938. The suggestion was taken up with enthusiasm, and since that date a Committee of the Association has drawn up a provisional plan for the Atlas, including a suggested list of contents, which was discussed at the Association's meeting held this year at Dundee. The discussion made it clear that scientific workers in many fields would welcome the appearance of such an atlas, and the view was expressed that the Royal Geographical Society, from the very nature of its constitution, interests, and membership, could give valuable assistance towards bringing the project to maturity. In the course of this afternoon's meeting it is hoped that constructive criticism and positive advice will be forthcoming: criticism and advice that should focus itself on one or other of the two outstanding problems, the ideal content of a National Atlas, and the ideal methods of cartographical presentation of those contents. But what, it may be asked, is a National Atlas? I cannot do better than quote from the Report presented by the Atlas Committee to the British Association: "The proposed Atlas aims at a strictly objective and scientific presentation of the natural conditions, natural resources, and economic development of the land [of Britain] and the adjacent sea, of the history and prehistory of our country, and of the distribution, occupations, movement, and social conditions of the population. It is believed that the publication of such an atlas would mark a great step forward in the dissemination of accurate knowledge of this country among the general public. The National Atlas would present, for the first time, on a uniform cartographic plan, the results of the various surveys, returns, and censuses made by Government departments: those for example of the Ministry of Agriculture, the Ministry of Labour, the Air Ministry, and the Registrar-General's department." In addition, the Report goes on to say, there is a growing body of information, gathered by research workers in particular fields, such as geologists, meteorologists, archaeologists, economists, historians, biologists, and geographers, the presentation of which in a uniform cartographical form would be of the very greatest value.

The complete Atlas would comprise two large folio volumes, with a page size of 21 inches by 14 inches, a size dictated by the desirability of showing on a double plate the map of England and Wales on a scale of 1/1 million. The map of Scotland on the same scale would occupy a single plate, the map of Ireland a half plate. It is held desirable that all the maps should be enlargements or reductions of an identical base map on simple multiple and submultiple scales, for this would facilitate rapid and accurate correlation—of agricultural and climatic maps for example, of the water supply map and the distribution of population, of the distribution of occupations and the distribution of disease or of amenities.

The general scheme of contents proposed is as follows:

Section A. PHYSICAL GEOGRAPHY: 1. Cartography; 2. Orography; 3. Geology and Lithology; 4. Climatology; 5. Hydrography.

Section B. BIO-GEOGRAPHY: 1. Soil; 2. Vegetation; 3. Distribution of Species; 4. Prehistory; 5. Land Utilization; 6. Forestry; 7. Agriculture.

Section C. INDUSTRY AND COMMERCE: 1. Coal, Iron, and Non-ferrous Metals; 2. Quarries; 3. Electricity, Petroleum, Coal Gas; 4. Waterways, Airways, Railways, Roads; 5. Ports; 6. Industries.

Section D. HUMAN GEOGRAPHY: 1. Archaeology and Prehistory; 2. Historical Geography; 2a. Roman Britain; 2b. The Dark Ages; 2c. Place-Name Elements; 2d. Agriculture; 2e. Population; 2f. Ecclesiastical; 2g. Industrial and Commercial; 2h. Parliamentary Representation; 3. Political Geography; 4. Strategic Geography; 5. Vital Statistics; 6. Social Geography.

Greater detail as to the individual maps to be included under these headings is available in the British Association Report, but from the summary here given it will be at once obvious that the intention of those sponsoring the Atlas is to include every sort of map that will help towards a better understanding of our country and our people.

Had the National Atlas been in existence before the outbreak of war, there is no doubt that it would have proved its usefulness in a hundred ways, providing immediate data for decisions as to evacuation areas, as to new and safer locations for industry, or suitable centres for the accumulation of food stores; besides indicating, for example, the relative accessibility of locations under consideration as regional capitals; or, in quite another field, providing in the shape of a map of past land use an indication of areas in which some desirable modification of present-day use was likely to be successful.

It is not of course the case that the map can supersede the detailed description or the volume of statistics, but it displays those details, those statistics in their distributional pattern, and this pattern has often great significance, affording a clue to relations of cause and effect. As an example we may examine the map showing the numbers and distribution of persons engaged in manufacturing industry, based on the census of occupations. The map allows us to envisage the distribution as a coherent whole: there is a pattern of distribution, and it is this pattern that must be the starting-point not only of interpretation, but of any plan for the redistribution of industry that is to be other than piecemeal and arbitrary.

It is greatly to be deplored that statisticians and economists are so reluctant to admit the usefulness of the map, even though it makes no higher claim than to be ancillary to the table of figures. A case in point is afforded by the memoir, in many respects admirable, devoted to the consideration of the Location of Industry, which was prepared by the anonymous group of scientists and technicians who term themselves P.E.P. Location can of course only be shown on a map, yet apart from a reference map indicating administrative boundaries, these writers were content to illustrate their findings by a population map which is so crude as to be almost meaningless. Moreover they were satisfied to use statistical tables which grouped together, for example, the occupational figures for West Cumberland and East Yorkshire, two regions so diverse geographically that no reasoning as to conditions

governing employment in the one could apply to the other. A National Atlas would be an education and a revelation to the members of this admirable research group, and it would perhaps not be too much to hope that it might prove an education and a revelation too to those Government officials who choose, each for himself, a different set of artificial subdivisions of this small country of ours under which to group and publish statistical material, thereby rendering the comparison, the correlation, in a word, the scientific use of such statistical material completely impossible.

DISCUSSION

Before the paper the CHAIRMAN (Professor KENNETH MASON) said: Some of you will remember the discussion opened by Professor Taylor in May 1938 on the "Geographical distribution of industry," a discussion connected with the evidence to be given by the Royal Geographical Society to the Royal Commission which was then sitting (*Geogr. J.* 92 (1938) 22–39). The Society later gave evidence before that Commission and strongly recommended that there should be a National Atlas of Britain. Professor Taylor has now carried the matter further, and has been chairman of a committee, originally formed at Cambridge, which has been going into the question of the National Atlas. We are to discuss to-night the first tentative proposals. I now ask Professor Taylor to open the discussion.

Professor Taylor then read the paper printed above, and the following speakers contributed to the discussion.

Dr. L. DUDLEY STAMP: In the first place, I should like to say that perhaps Professor Taylor has been speaking under some difficulty, in that the National Atlas has been referred to at meetings of the British Association and has undoubtedly secured amongst all those interested in the subject a general measure of agreement that such an atlas is badly needed; she has really been preaching to the converted. In fact, we in this country must admit that in this respect we are far behind the majority of the great Powers, and indeed many of the smaller countries. One may refer to such magnificent productions as the *Atlas de France* and to the splendid publications, notably the agricultural atlas, of the United States, and many others known to geographers. The point I wish to stress is that in the initiation of the project Professor Taylor has the goodwill of the vast majority of scientists, at least in this country, and of many others who are interested in the cartographical presentation of information. Indeed, from day to day one finds, in sometimes unexpected quarters, the interest which the project of the National Atlas arouses.

The Ministry of Health was not, I think, mentioned as one of the departments of the Government which might be interested, but in casual conversation I asked Sir Arthur MacNalty, Chief Medical Officer of that Ministry, whether they would be interested in a National Atlas. He displayed immediate keenness and suggested that there should be a conference on the subject at the Ministry. It is unfortunate that owing to the pressure of urgent work representatives of the Ministry of Health who had hoped to be present this afternoon have been unable to come, but I have been asked to read a note sent to me as indicating the interest taken in the subject. The following is an extract from a minute prepared by an official of the Ministry of Health, and you will note that it suggests a number of additional maps which might well be included:

"Theoretically all statistics which are collected on a geographical basis could

presumably be turned into maps. It is for the statisticians to say which of their figures would yield significant results in map form, but the following suggest themselves:

(1) Mortality and morbidity statistics.
(2) Personal health services—maternity and child welfare, tuberculosis, venereal diseases, hospitals, etc. These could be shown in relation to (*a*) the provision and (*b*) use by the public.
(3) Medical benefit in such terms as panel doctors per head, average size of panel, cost of medical benefit per head (N.H.I. statistics, apart from medical benefit, are not of course available on a geographical basis).
(4) Provision of environmental services—
    (*a*) Piped water supplies, acreage of open spaces and recreation grounds per head, etc.
    (*b*) House production, slum clearance, prevalence and abatement of overcrowding.
    (*c*) Successive stages of town planning control.

As a background to these figures:

(5) Local financial resources measured by such matters as rateable value per head, block grant, etc.
(6) Widows', Orphans', and Old Age Pensions.
(7) Economic status of the different areas measured by public assistance statistics and statistics collected by the Ministry of Labour, U.A.B., Board of Trade, etc."

This list indicates a further extension of the already wide field that such a National Atlas should cover.

In conversation, Mr. Macgregor, of the Ministry of Health, made a point which I think Professor Taylor may be particularly interested to hear. He said that, though it might be felt that at the moment it is quite useless to think of carrying on a project such as we are discussing, this is none the less the right time in that there has been a halt in some of the great national projects, notably in slum clearance and housing. Now is the opportunity to take account, particularly in map form, of the progress made in the past twenty years. We are at the moment, curious as it may seem, in a relatively static position regarding the mapping of a number of important features of the life of this country.

I need scarcely say, speaking now on my own behalf, how very much I think my geographical colleagues in the universities would agree with me in supporting any effort which can be made to carry forward this project of a National Atlas. Professor Taylor's suggestion is really one for the creation of an historical document. In that sense the Atlas would be of permanent value. Some might argue that the present changes are so great that an atlas prepared now would have little value in a few years' time. That does not apply, I think, to the majority of the maps which would be included in such a stocktaking of our national resources.

I hope it may be possible to proceed actively with this project. War affects different people in different ways. Some who are busy in ordinary times find the additional work which faces them almost overwhelming; on the other hand, this war has proved itself a time of waiting for very many, and there may be others amongst, shall I say, the intelligentsia of the country who are not yet fully employed. It is to be hoped that they can still turn their attention to carrying out some of the researches for this Atlas. Finally, the Royal Geographical Society has in the hundred years of its existence sponsored very many great projects in the geographical field. We have on previous occasions heard how the

sphere of the Society must of necessity be enlarged and developed to meet the needs of the time. I hope that it will be possible for it to take a really active part in forwarding the National Atlas project. One at least might suggest the formation of a permanent committee with its location in the Society's house.

The CHAIRMAN: I will ask the Secretary to read a communication received from Major-General MacLeod, the Director-General of the Ordnance Survey.

Major-General M. N. MACLEOD: Professor Taylor's remarks about the usefulness of maps and the reluctance of statisticians and economists to use them deserve special attention. If a National Atlas were to do no more than to illustrate this usefulness and overcome the prevailing ignorance in this respect, it would have achieved a good deal. I am sure that information about distribution and location can be shown more clearly, concisely, convincingly, and usefully by maps than in any other way. The value of a National Atlas can therefore hardly be doubted, but the practical questions to be answered are not only what sort of, and how many, maps should constitute the Atlas, but also how should these maps be prepared and published.

As regards the latter, the main point to be decided is whether the Atlas should be published by the Government or with Government assistance, or whether it should be left to private enterprise. The view of the originators of this project, including Professor Taylor, is, I believe, that the Atlas should be an official or semi-official production, printed by the Ordnance Survey, and marketed by the Ordnance Survey along with its other maps. It may, I think, be conceded that a national survey like the Ordnance Survey has an analogy with the National Atlas, even if it has not actually created a precedent for the method of producing the latter. If the Atlas were not published by the Ordnance Survey it would have to be published by some private society or firm, its production being treated as a strictly commercial proposition and the costs being covered, with a margin of profit, by sales to the public. I very much doubt whether any private organization would be prepared to undertake the production, in the form envisaged by Professor Taylor, on this basis, and I suggest that the analogy of the Ordnance Survey is here instructive, for if the surveys of Great Britain had been left to private enterprise it is improbable that the country would have such good and cheap maps as it now enjoys.

By a Treasury ruling of long standing, the prices of Ordnance Survey maps are not intended to cover the whole cost of production, and the cost of the survey in the field is a charge against the National Exchequer. I am not able to quote the arguments which induced the Treasury to authorize such a policy, but it is, I think, a recognition that the national maps can be produced most cheaply by a single national agency, and that the cost of their production is eventually more than offset by the immense economy to a whole host of interests—Government departments, local authorities, public utility companies, private corporations, and individuals—whose time is saved, and whose efficiency is increased by their ability to obtain accurate topographical information without delay and at low cost. If the Ordnance Survey is to undertake the production of the National Atlas in addition to its present functions, it will be necessary to convince the Treasury of its value; and lest it be thought that I am throwing cold water on the project, I hasten to add that I personally share Professor Taylor's view of its importance. I agree, in short, that its production might well be entrusted to the Ordnance Survey, but it is for bodies like the British Association and this Society, separately or in combination, to place the proposal before the Government if they think fit, and marshal convincing arguments in its favour.

Let me however assume that the problem of production has been solved, and offer a few observations on the composition of the Atlas. Professor Taylor has

indicated its contents in outline, but I am not quite clear whether she envisages the Atlas only as a finite production consisting of so many sheets on some particular scales, showing just so many items of information. I suggest that the sheets constituting the Atlas should be sold separately as well as in the form of collections, and that the term "Atlas" should include all maps of a particular character, and of a particular size; thereby including regional studies which amplify any national study and which can be fitted easily into a national frame. I suggest that the National Atlas might be a loose-leaf collection of maps, definitely related to, and indeed merged into, the national cartographic system, and I would like to draw attention both to the use of the national grid recommended by the Davidson Committee in this connection, and to the fact that the new 1/2500, 6-inch, and 1/25,000 Ordnance Survey sheets based on that grid will be of sizes which can be printed quite conveniently on the pages suggested by Professor Taylor.

Captain CYRIL DIVER: Although I am a member of Professor Taylor's committee I have not before had the pleasure of hearing her in full provocative spate. I must say that I find myself in wholehearted agreement with her strictures. During her remarks she spoke of the value of maps as a means of displaying distributional patterns. I should like, for a moment, to enlarge on that aspect from a biological point of view. It is often quite impossible to arrive at true interpretations of groups of biological facts unless their patterns can be seen clearly and as a whole in such a way that they can be correlated directly with other relevant patterns. A distributional census of some groups of animals or plants can perfectly well be presented, as statisticians present economic data, in tabular form; but it is most difficult for the ordinary man and even for the trained biologist to realize fully what is happening until he has seen those data plotted on a map. When that has been done one immediately gets, to borrow a racing expression, the form at a glance, and if it is done in such a way that the maps are readily comparable with meteorological, geological, physiographical, or other mapped data, one begins to see for the first time some of the important factors which determine, or may be concerned with, the limitation or possible expansion of particular distributions. The study of such distributional patterns for particular organisms may, for instance, prove invaluable in determining not only the centre of infection of some pest but also the chances of that infection spreading over a wider area; and may even indicate the steps that might be taken to bring that pest under control. These facts are often insufficiently recognized even among biologists, and I feel certain that the publication of a National Atlas would be of great value in focusing the attention not only of laymen but also of trained biologists upon the importance of the geographical approach.

Dr. E. B. BAILEY: I expect I am speaking with the agreement of every one here when I say the Atlas is much needed and will be of great value to the country. I and my staff are however at present fully occupied, and we are not hopeful of doing anything special during the war. I was delighted to hear the Director-General of the Ordnance Survey come so near to saying that the Ordnance Survey would be able to undertake the publication. That would enormously strengthen the project, and would make easier the incorporation of maps such as the 25-mile-to-the-inch Geological Survey map of the British Isles, or the 10-mile-to-the-inch maps of England and Wales, and of Scotland.

The SECRETARY then read the following communication sent by Dr. S. W. WOOLDRIDGE, Secretary of the British Association Committee on the National Atlas:

It was apparent at more than one stage of the committee discussions during

this year that members recognized the radically different problems presented by physical and biological data and certain of the socio-political data which it was proposed to combine in the Atlas.

As regards the former, a strictly objective presentation of the facts would be possible and the necessary data are mostly now available. I am far from asserting that an objective handling of economic, social, and political data is out of the question: it can and should be attempted. Nevertheless it is idle to deny that much of the statistical material, say for example that dealing with unemployment, is only of temporary significance and it could be handled in a tendentious and misleading fashion. It must therefore be remembered that many of the subheadings of sections C and D of the proposed Atlas involve research which has yet to be carried out.

Stating the matter somewhat differently, we may say that the mapping of much of the human data produces not a map, but what many of my colleagues call, not too euphoniously, a cartogram. And a cartogram can lie most foully unless its basis is made fully clear and it is accompanied by a written interpretation. These considerations need not and should not divert us from studying and mapping the facts of human geography in our country, but we must realize that such study, with local and special exceptions, has not proceeded beyond the stage of text-book presentation. If it be objected that this statement is unjust, it must at least be conceded that the studies to which I refer have not been published even if they exist as concepts, projects, or in manuscript.

The practical conclusion which seems to me to emerge is that the publication of any National Atlas should be serialized, thus enabling us to realize at once part of the ample capital offered us by the physical and natural sciences, while we initiate the necessary research into social facts and their cartographical representation. It is not my intention to try to insulate this part of the field with a wadding of academic caution, but hasty and ill-digested work on these aspects could go far to mar the prestige and utility of the Atlas.

Mr. G. R. CRONE: I had prepared some remarks on the existing National Atlases, but it is not necessary to discuss them in great detail now. From a general survey it is clear that the National Atlas of Great Britain and Northern Ireland, as planned, would be as comprehensive as any existing atlas. As Dr. Wooldridge has said, many of the maps would be compiled for the Atlas and it would not be merely a collection of already existing material. This is really a plan for research as much as a proposal for a National Atlas.

There is one question which has not been discussed, namely the size of the Atlas and the maps in it. Professor Taylor has suggested that they should be on the 1/M scale. From the point of view of practicability however there is something to be said for a smaller scale. If the sheets are eventually to be bound up into an atlas they obviously will have to be folded, and there will be some inconvenience in using them with a fold across the centre. Even if they go into a portfolio, and the numbers of the sheets run up to one or two hundred, the Atlas will be a weighty object to deal with, especially from the point of view of the map curator. I suggest it might be considered whether the scale of 1/1·5M for England and Wales would not be sufficient. The limiting factor is the size of England and Wales on one sheet. If England and Wales were on a scale of 1/1·5M, there would be no need to fold this sheet and the British Isles could be put on the same sized sheet quite easily on the scale of 1/3M. The scale adopted will also have some effect ultimately on the price at which the Atlas can be sold, which I think should be a consideration, because it is the type of atlas that should go into schools and university departments. If it is to be on a very elaborate scale its use is not likely to be so widespread.

The *Atlas de France* for instance has a considerable range of scale. It contains one set of four maps on the scale of 1/1M, and another on the scale of 1/1·25M, but other maps are on various scales up to 1/12M. It would be quite possible to have at least nine maps of the British Isles on the scale of 1/10M or 1/12M on the same sized sheet as the map of England and Wales to the scale of 1/1·5M. In the French atlas also each sheet contains a statement of the source from which the map has been compiled. This is important as it shows the state of knowledge at the time and serves as an index of reliability. Obviously in dealing with a large area some of the observations must be generalized and some founded on more exact study. It is important that there should be a distinction between the two.

Another point concerns the base map to be used for the distribution maps. On the Ordnance Survey map of Roman Britain, for instance, the historical detail appears to be rather overshadowed by the physical. It is really a physical map with historical information added. It might be better to use contours alone in such a case, to bring out more clearly the distributions to be shown. It is undoubtedly important to have that physical base, so that the relationships can be easily seen; at the same time it should not be over-emphasized.

I was chiefly interested in the schedule of the proposed maps of the historical geography, because at the present time there is no separate historical atlas of Great Britain which has anything like the scope proposed for the National Atlas. It would be desirable to open the historical section with a map showing the position of the British Isles on the globe, and their relation to the great belts of surface phenomena, for much of the history of the British Isles has developed in connection with overseas regions. From the same point of view there is something to be said for a map of the naval campaigns, at least in home waters, showing perhaps the importance of the various naval bases at different periods; for instance, the relation of Plymouth to the Spanish wars, Portsmouth and Dover to the French wars, Harwich to the Dutch, and of course the north of Scotland to the present situation.

Mr. E. W. GILBERT: It has been pointed out that Great Britain is much behind the other great Powers such as France, but she is also notably behind smaller Powers such as Finland and Czechoslovakia, both of which have produced very fine National Atlases. And here I come to a mild criticism of Professor Taylor's scheme. None of these national atlases, so far as I am aware, has elaborate sections on historical geography, to which it is suggested that a large section of the British National Atlas should be devoted. I am not only speaking for myself, but also for other geographers, when I say that this proposal needs defence and explanation. Dr. Stamp quite rightly said that the suggested National Atlas is to be a "stocktaking" of the national resources. If that is its primary function is it really necessary that the Atlas should contain an elaborate historical section, including maps of the very early stages of the history and even the prehistory of Britain? I am myself to some extent an historical geographer, but I feel that a large section on historical geography is quite out of place in a National Atlas of this kind, and that a separate atlas should be the objective of British historical geographers. In the United States of America a separate atlas of historical geography was produced with notable success, and this course should be imitated in this country.

Secondly, I wholeheartedly support Professor Taylor in her attack on the economists who can be singularly stupid about maps. In Oxford they produced statistics showing the original homes of the persons who have migrated to Oxford during the great industrial movement which has taken place to that city. They prepared these facts in tables. It was suggested that this information

should be produced in map form, but a distinguished economist said that that would be no help; he could see all he needed to know from the figures. I asked him if he knew where some of the places were, but he had not the slightest idea. Nor had he any idea as to what Professor Taylor called the "pattern" of that migration to Oxford, which is most interesting and peculiar.

I wish to refer to the question of regions, with which I dealt in a paper published in the *Journal* for July 1939. I support Professor Taylor in bitterly regretting the fact that a National Atlas was not ready before the war. Since the war commenced the Government has been producing many new regional schemes in addition to those cited in my paper; for example, the petrol regions. Most of the new schemes, as far as I can gather, follow the Civil Defence regions. That seems to be the ideal division according to the Government, but it is open to serious criticism. If the National Atlas had been ready before the war we could have had one scientifically planned regional scheme. And surely it is most desirable that, for re-planning the country after the war, we should have the National Atlas ready for use. Time and money should be given to this project, even during the war, in order that all the necessary information may be available in map form for those who have to reorganize Britain after it.

Mr. J. C. B. REDFEARN: My interest in the National Atlas lies on the cartographic rather than on the statistical side. It is the production of such a work which particularly interests me, and from that standpoint there are one or two points of interest which have been raised in the course of the discussion.

I did not hear clearly whether the Ordnance Survey were prepared to look favourably on the question of producing this Atlas or not. I imagine that in war time at least, and for some considerable time to come, the Ordnance Survey will have their hands full with other things. I am rather inclined to think that the Royal Geographical Society should consider whether it cannot undertake the production of the Atlas, because it can at least call upon as many specialists, if not more, than the Ordnance Survey can. The Society could, I believe, get into more direct contact with the geographical schools of Oxford, Cambridge, and other universities, and I believe that it could look for assistance from a wider field of activity and of collaboration than the Ordnance Survey could, at least at the present juncture.

Secondly, I strongly support the suggestion by the Director-General of the Ordnance Survey that the Atlas should be a loose-leaf atlas, for several reasons. An atlas of the format proposed by Professor Taylor will be a fairly large one. If all the maps desired are produced—and probably the scheme will grow like a snowball before reaching the final stage—then there will be few who will buy the Atlas. Some will be interested in one section, others in another. If it were a loose-leaf atlas those interested could buy sufficient sheets to cover their own particular section. Thus a loose-leaf scheme will help to extend the scope and promote the sale of the Atlas. Again, certain sheets will not become out of date; others may need renewal. Further information may be forthcoming necessitating a new edition, or a few minor alterations may be required. With a loose-leaf atlas it will be possible to replace an old sheet by a new one. Not only would a loose-leaf atlas lead to increased sales, but it would be possible to keep in touch with a larger public, thus providing a better opportunity of covering the initial cost than by producing a single volume which very few people will be able to dip into, and which will only be found in the Society's Map Room and in certain Government departments.

If the Society could see its way to taking up these matters I believe that, with the collaboration of many of the geographical experts and others interested from

the technical point of view, it would be possible to save largely on the cost of production. According to Professor Taylor's suggestions, there will be a number of pages on which there will be four or eight diagrams, say, of England and Wales. They need not all be drawn separately. Even one page of four or six outlines could be used as the black basis of quite a number of the pages. It would only be necessary to "strip-in" on the negative the matter for the title, etc. The outline blacks could be used over and over again. Again, it is possible by the use of negative and positive plates to reduce considerably the cost of preparing colour plates; in fact, colour plates could be prepared by draughtsmen rather than by cartographers. It is a simple matter: I had much to do with the production of a recent school atlas which was prepared practically entirely by this means and was brought out for a very reasonable figure.

From the production point of view, I think collaboration by the Royal Geographical Society and others would largely contribute to the success of the proposed National Atlas if it was brought out entirely on our own. If we hope to get anything from the Government, through the Ordnance Survey or any Government department, we are likely to have to wait for a very long time.

Dr. H. ORMSBY: I would like to support very strongly what Mr. Redfearn has said with regard to a loose-leaf atlas, partly for reasons of economy and also because unless it appear in that form it will be such a long time before the work is completed by the various committees and researchers that many people alive to-day would hardly hope to see the publication.

The method adopted by the French in bringing out their atlas sheet by sheet has already proved very valuable. On certain sections they have the work finished, and it seems to me that as sheets of the National Atlas are completed they should be put on the market as quickly as possible. The physical maps can be brought out fairly quickly, so can the population maps; those calling for some particular piece of research and work that depends upon the correlation of publications of various Government departments naturally take longer. The portions which are completed at one time or another should not be held up even until one section is ready and certainly not until the whole Atlas is ready.

Mrs. A. R. HATLEY: I support the suggestion as to a loose-leaf atlas, especially for Great Britain, where correlation is so important in relation to the physical background. It would be a great advantage to be able to place maps side by side when working on them.

Mr. G. W. PIRIE: Provided that the National Atlas sheets are mounted on guards it will be possible, either in a loose-leaf or in a bound volume, and keeping to the suggested 21-inch by 14-inch page, to give 1/M maps of Britain and Ireland on one sheet; in the library edition this might be dissected and folded. A 1/M motoring map of the British Isles with a printed surface 34 inches by 38 inches has been on sale for many years, and the printed surface of sheet 131 of the one-inch Ordnance Survey of England (5th edition) measures about 31 inches by 40 inches. The Atlas maps might also be placed on sale folded in the usual way for the general public, and flat for teachers and students.

That Scotland should be on the same 1/M sheet as England is desirable for many of the proposed maps, and for some (such as geological and morphological maps, railways and communications, fishing, and several of the distribution maps) Ireland should also be shown on the 1/M map along with Britain. The 1/M scale will often be none too large.

If the maps are prepared so that each sheet is to some extent complete in itself it should be possible to interest in the National Atlas tourists, railway enthusiasts, salesmen, advertising men, statisticians, medical men, sportsmen, and others who give little thought to geography. These publics might be reached

through their specialized press and their trade journals, which publications might provide a supplementary means of distribution for some of the sheets. On each sheet should be a fairly full note on published or contemplated sheets dealing with related subjects.

It might be well to use colour sparingly. On account of the great expense at every step in elaborate colour printing, the publisher will print an edition calculated to sell, unrevised, for a decade. Extracts from the Atlas are likely to be used frequently in text-books, journals, and on lantern slides, and in all these cases the information conveyed by colour schemes will seldom be reproduced properly. By exploiting the possibilities of mechanical tints, stipples, and hatchings to the fullest it ought to be possible for most of the sheets to convey the essential information on the black key alone. Then to liven the appearance of large maps the colours of the Swedish flag might be employed—a clear bright blue which will not photograph and a yellow which would not seriously obscure the tints. Even in planning fully coloured maps the designer should bear in mind the half-tone values of the colours employed. Maps in the 1928–35 edition of Brockhaus's Encyclopaedia show interesting arrangements of elaborate mechanical tint and limited colour.

Each sheet should have its date of publication unambiguously marked on it. In any text that may accompany the maps the eye should not be fatigued by a line of type too long for the size of type employed: a common fault in atlases.

It would save individuals an immense amount of time, and would help to relate all the maps in the Atlas, if the Committee would as soon as possible prepare for the contributors and others grey outline base-maps on the 1/500,000 and 1/M scales, showing coast-lines, rivers, outcrops, and parish boundaries, and selected contours, roads, railways, and town sites.

The SECRETARY then read the following contributions:

Professor A. G. TANSLEY: I should like to express my hearty concurrence with the views put forward by Professor Taylor. It is difficult to over-estimate the importance of cartographical representation of every kind of data. It is only by the strictly objective plotting of phenomena on maps that the full meaning of their distribution and correlations between them can be appreciated. Neglect of mapping involves the missing of significant relationships and leads to the choice of arbitrary and unnatural divisions of the country for the grouping of statistical and other data, thus obscuring vital connections, and at the worst seriously misleading the student and the interested public. It is not least in its educative influence, both on Government and local officials and on the public, that the benefits of a National Atlas will be found; and there can be no doubt that collections of maps on the lines contemplated are indispensable both for the understanding of the distribution of natural and man-made phenomena, and for the intelligent planning of national development and reconstruction.

Dr. H. C. DARBY: The understanding of modern distributions demands a series of historical maps as a background, and the time is now approaching when the data required to build up such a series will be available. The way has already been shown by the admirable Ordnance Survey maps of Britain in Roman times and during the Dark Ages. The intense interest shown in these maps is a measure of the need they are fulfilling. The need for analogous maps of later periods is no less great. Two large collections of statistics at once suggest themselves as fertile material for mapping: the Domesday Inquest of 1086 and the Census Returns since 1801. It is a surprising fact that no comprehensive analyses of these two collections have yet been made, but work upon both is now progressing.

Between the eleventh and the nineteenth centuries there are unfortunately no such comprehensive surveys. But there is a variety of miscellaneous material that can be made to yield coherent pictures when subjected to modern interpretation and cartographical method. The map of medieval South Wales prepared by Professor William Rees is a model of what an historical map should be, and the work of Dr. Pelham too has shown how the rather intractable records of medieval England can be plotted on maps. For the post-medieval period there are already available general maps showing the progress of the enclosure movement, maps showing developments in communications, in turnpike roads and in railway building, maps showing the geographical circumstances of particular industries at various periods. But these, and others like them, have been prepared in connection with particular topics. They remain scattered in books and journals, or as individual sheets. In this scattered form it is impossible to see them as sequences that lead up to modern conditions. Until they are assembled they must remain without their full implications.

This must not be taken to mean that all the work that remains to be done is that of assembling. Far from it: much material remains to be sifted before it can be plotted. The excellent work of the Place-Name Society has yet to provide the material for a complete map of the major place-name elements. The full cartographical possibilities of the Hearth Tax Returns of the seventeenth century have yet to be explored. Much detail has to be added to some of the existing general maps of economic distributions before they can be called definitive. The need is for the collation of existing maps and for these to be supplemented by further research.

The CHAIRMAN: I will ask Professor Taylor to answer some of the questions, and to sum up.

Professor TAYLOR: I wish, first, very forcibly to say how welcome have been the positive suggestions; especially the realization of the many different quarters from which has come the demand for the serialization of the National Atlas and the publication of it in a loose-leaf form, a form which not only allows it to be bought in parts in accordance with the taste of the buyer, but also obviously allows a beginning to be made on the material in existence. As research progresses sheets can be added to the Atlas. You may be sure that all such positive suggestions will be carefully noted and utilized by members of the committee, especially the suggestions made by Mr. Redfearn as to cartographical methods and methods of securing economy.

There seems to be some misapprehension as to the historical sections. It is not proposed to have an historical atlas bound up with the maps, but to introduce only those historical maps (and they are not a few) which have their bearing on the present state of Great Britain.

As regards the suggestions by the Ministry of Health, I may say that we have already proposed to implement some of them, especially those with regard to public services and health services and amenities. Mr. Gilbert has been working out such a scheme. There again a very fruitful communication has been made by Dr. Stamp, and we shall be able to explore the possibilities of mapping those statistics which his medical friends at the Ministry of Health have brought to our notice.

The question of serialization impinges also on another suggestion in a letter from Professor Fleure, of Manchester, in which he suggests that what is demanded, and indeed is implicit in what has been said this afternoon, is a more or less permanent organization. That really does suggest attachment to such an existing organization as the Ordnance Survey, or to one of the learned societies, so that the National Atlas is not looked upon as something which is to be com-

pleted but as something that is an ever-growing, ever-living, as it were, mirror image of our country in all its aspects and in all its changes.

The CHAIRMAN: It only remains for me now to thank Professor Taylor very much for opening this discussion and to thank those who have contributed to it. You can be sure that the Society will be only too willing to take its part in forming, if required, a committee to help in getting the material together. Probably it will be a very long time before the Ordnance Survey will be able to do any work on such a compilation. The compilation will undoubtedly have to be done largely by geographers and others in the various universities. Already, in these early stages, certain parts of the Atlas have been allotted to experts in various universities to draw up this preliminary scheme. If a committee is formed in London, possibly based on the Society's House, we shall need the help of a large number of geographers; that is the only way in which we can hope to get the Atlas completed within measurable time.

It is very useful to have had an expression of opinion this afternoon from so many people that they prefer a loose-leaf atlas to a bound volume. There is no doubt that that expression is almost unanimous amongst us here.

You might like to know that amongst those countries that have produced a National Atlas so far are Finland, Czechoslovakia, Poland, Russia, Germany, and France. I do not know whether there are any others. In any case we are rather behindhand, possibly because we are a peaceful nation.

There is nothing more I can add, except to convey to Professor Taylor your very hearty thanks.

THE BRITISH CANADIAN ARCTIC EXPEDITION

LIEUTENANT P. M. BENNETT, R.E.

THIS is an account of the work of the British Expedition to the Canadian Arctic, which with the support of the Royal Geographical Society left England early in 1936, together with a description of the surveys carried out up to the autumn of 1937. A short article on the expedition has already been published in this *Journal* (90 (1937) 160–1). An account of the doings of two members of the party for a portion of the period appeared in *The Times* in May 1938. When the members still in the field have returned, it will be possible to complete the record of the expedition's work as a whole.

T. H. Manning, the leader, had spent the years 1933–35 on Southampton Island (*Geogr. J.* 88 (1936) 232–42), but had difficulties with his wireless receiving set and had been unable to pick up the time signals for his astronomical fixes. He succeeded in running compass traverses round most of the coast-line and along the main watersheds of the interior, but lacked the necessary fixes to tie his traverses. The north-east portion of the island consists of ranges of gneiss hills falling steeply into Foxe basin, and along this shore the sea remains open throughout the year right up to the base of the cliffs, thus making it impossible for a dog-sledge to travel along the shore.

The first objective of the expedition from the survey viewpoint was to complete Manning's map of Southampton Island by obtaining the necessary astronomical fixes and by making a summer sea trip along the eastern coast. It was intended to reach Southampton Island early in the summer of 1936, to spend the summer in the south of the island, sail up the west coast, and form a winter base in Repulse Bay on the Canadian mainland, and to spend the winter surveying the coast-line and interior in that region. Ice conditions permitting, an early start would be made in the summer of 1937, when the intention was to sail down the east coast of Southampton Island, cross Foxe Channel, visiting Dorset, Mill and Nottingham Islands, and connect with the R.M.S. *Nascopie* at Cape Dorset in S.W. Baffin Island. From Cape Dorset the boat would be taken as far as possible up the west coast of Baffin Island, and a winter base established from which the coast and interior could be surveyed.

The arctic summer lends itself to intense scientific activity during the short period when the land is unfrozen, and the scientist should spend a considerable time in one locality, in order to make his collection as comprehensive as possible, whereas the surveyor is constantly anxious to advance to fresh ground. These two objectives will clash, but they will frequently be settled by an uncontrollable factor: the condition of the sea-ice, which will decide the possibility of movement. In the winter months, once the sea-ice has formed, travelling conditions are more calculable, and the surveyor has a better chance of achieving his objective, though his plans will often be defeated by soft snow and drift, and consequent slow travel, shortage of dog food, and lack of time to await favourable conditions for astronomical fixes. Nevertheless in the winter months the scientist must tend to hibernate, whilst the surveyor is fully occupied.

The Canadian Northwest Territories are inhabited by the Eskimo, and

where there is a reasonable possibility of being able to get in an annual stock of supplies the Hudson's Bay Company have established fur-trading posts. The expedition was able to make full use of the facilities provided by the Company; arrangements were made for most of the supplies and equipment to be carried on their boats, and by employing various posts as stepping-stones, the need for a permanent base was eliminated. In April 1936 the expedition assembled at Churchill on the west coast of Hudson Bay, which is now connected by railway to the prairie provinces, enabling wheat to be shipped to Europe by a short sea route during the short navigation season in Hudson Strait.

At Churchill our 30-foot whaleboat was built by a Norwegian and christened the *Polecat*. It was considered that a boat of this size would be most suitable in ice conditions, as it would be small enough to take shelter behind a large mass of ice or in a small bay in an ice-pan, and light enough to be hauled up on to a pan if surrounded by closing ice; yet would be able to take the equipment necessary for a summer, and sufficient food to enliven the main diet of the meat of the country. It was fitted with a 30 h.p. Universal marine engine which was sufficiently uncertain to ensure that life was never dull whilst dependent on it. It was the proud boast of the manufacturers that the cylinder head was secured by a larger number of bolts than in any other make. The expedition entirely failed to appreciate this feature, although they did in time become fairly efficient at removing the head. The main carburettor block, on the other hand, was supported from its head by a single bolt, which soon wore out the cast-iron threading on which it was dependent. Originally equipped with eight jets it finally functioned on three, and was held together by solder, wire, string, adhesive tape, sealskin line, and two sorts of glue. Air went in at a number of unauthorized places, and petrol came out at others. The consumption of sparking plugs was considerable, particularly in the fall, when everything on board remained wet and salty, and the temperature was low. The gear lever soon succumbed in a battle with a rope fender, and a walrus tusk, carved to fit the stump, proved the most satisfactory substitute.

Sails were fitted, but the *Polecat* was flat-bottomed and would do little but run, and except on one occasion, they had been little used when the mast was carried away. The fo'c'sle was 9 feet long with a triangular floor space 5 feet wide at the entrance, and 3 feet high, with lockers beneath the floor, and in this cubicle five people on occasion cooked, ate, and slept. Amidships the cargo was packed and covered by a tarpaulin which clipped down on to the gunwales, and on this the team of twelve dogs lay, making a top-heavy but surprisingly docile supercargo. Astern was towed a 20-foot freight canoe, a seaworthy craft capable of carrying 1500 lb. of cargo. An 8 h.p. Johnson outboard motor was carried for use either in the whaleboat or canoe. An open boat did not prove satisfactory, as the cargo remained wet and scientific equipment and specimens degenerated, whilst the shortage of space was acute. A rather larger, decked boat, such as a 3-ton Peterhead which is used in several places in the Arctic, would have been preferable.

The expedition camped in their 15-foot Everest tent, which, except for the zip-fastener door, proved excellent. By the end of April the ptarmigan migration was in full swing and the ornithologist had plenty of work. Some dogs

The "Polecat" in Duke of York Bay, September 1936

Polecat Harbour, Frozen Strait, October 1936

The dismasted "Polecat" on the north shore of Frozen Strait

were purchased, and those new to the game were able to try their hand at driving, several short trips after seal being made. It was hoped to start at the end of May and go north along the outer edge of the sea-ice. Calm weather is expected at this time of year, and there is perpetual daylight, whilst with the floe still fast to the shore there is less drift-ice to contend with. The expedition engineer became quite ashamed of his continual visits to the elevator workshop, each time with a different part demanding repair or replacement. One night the boat was very nearly lost soon after launching. It was anchored to the shore-ice near the mouth of the Churchill river, but the river-ice above was rotten and showed signs of breaking. It was thought advisable for a picket to sleep on board in case of trouble. The break came late one evening, and enormous pieces of ice crashed downstream carrying the boat with them. The duty picket spent a harassing night amongst the ice, but brought the boat safely in to dry land in time for breakfast.

Despite the warnings of the local prophets as to the earliness of the season, the expedition got away at the beginning of June. At that time the party consisted of T. H. Manning, leader and surveyor; P. D. Baird, geologist and engineer; R. J. O. Bray, ornithologist; R. G. M. Keeling, doctor; G. W. Rowley, archaeologist.

A rapid and uneventful passage was made to Chesterfield Post, 300 miles farther north. The ice-bridge across Roes Welcome sound, between Cape Fullerton on the mainland and Southampton Island, forms two years out of three. The conditions required are a cold spell coincident with neap tides and still weather in January or February, when there is sufficient drift-ice in the sound. A solid block between the two shores may then form and given a few days of these conditions the block will remain solid well into June. When this bridge is not formed there is a constant stream of drift-ice carried down by the strong current, and as this happened in 1936, the expedition had to contend with a large quantity of ice instead of being able to cross comfortably on the lee side of a solid floe. The crossing was accomplished through leads of open water, although the course was chequered and there were some anxious moments. On one occasion the stores were landed on an ice-floe and a start was made in hauling up the boat when the emergency passed; fortunately so, as it had become evident that to pull up the boat with the inadequate tackle carried would be almost impossible.

Bray had decided to spend the summer on the low limestone marshland at the mouth of Boas river in the Bay of God's Mercy. This locality is one of the two known breeding-grounds of the blue goose, and Bray hoped to make a thorough study of this bird from the mating season until the goose again migrated south. He was landed there in the third week in June, by which time the thaw had set in, and all the low-lying ground was covered by snow-water and slush, whilst the ice-floe had started to break out. There was one solitary patch of grass the size of a table cloth rising above the water, and on this Bray's tent was pitched. The expedition was anxious to push forward whilst the weather remained favourable, so his equipment and summer supplies were dumped on the ice-floe and the *Polecat* departed. There was a steadily increasing channel of water between the store dump and the shore, and Bray had strenuous work to get his stores to safety. It was a race against the

channel, which steadily grew, and finally he found himself out of his depth, and was forced to abandon the last few loads.

The rest of the expedition remained together until August. Camps were made at Nukshanngnaq and at Ranger Brook, named after the species of seal which frequents it, whence Baird made a trip into the Nuvudlik, a range of peculiar shed-like limestone hills; also at Walrus Island. At these camps astronomical and magnetometer fixes were obtained, and sites of Eskimo houses were excavated by Rowley.

Southampton Island was formerly inhabited by a distinct group of Eskimo who were whale-hunters. These people, unlike other Eskimo, lived in houses built of stone, turf, and whale-bone. Little is known of them except that they were looked down upon by the mainland Eskimo, who considered them dirty and rather stupid, and they died out some forty years ago. The present Eskimo on Southampton Island are Aivaliks from Repulse Bay and Baffin Islanders from Cape Dorset, the latter having been moved in when the Hudson's Bay Company established a post there some fifteen years ago. Dr. Mathiassen, of the Fifth Thule Expedition, spent a few months on Southampton Island in 1922–23, but was unable to excavate because the ground was frozen; Rowley found much to keep him busy.

The existing map (*Geogr. J.* 88 (1936) 288) shows Walrus Island some 20 miles out of position, and a stay was contemplated sufficient only to obtain the necessary astronomical fix and a supply of dog food. These tasks were both accomplished and preparations had been made for departure when a sudden storm brought in a sea and swamped the boat. With great difficulty the magneto had been persuaded to spark again when the elements decided that a second swamping would be salutary. Both the magneto and its spare number gave up struggling. As the *Polecat* would only sail before the wind, it was necessary to wait for a southerly breeze to carry the party up South Bay to the H.B.C. post, where contact with the *Nascopie* was to be made. Tea and tobacco were the only luxuries of civilization remaining unconsumed, and the food problem was simple. Walrus and little auk were the two alternatives, the walrus becoming higher day by day. The equanimity of the party was disturbed because no one knew when the *Nascopie* was scheduled to arrive at the post, and opinion varied as to which would arrive first, the ship or a favourable breeze. On August 13, after a fortnight's delay, the breeze arrived, and the *Polecat* ran before it up South Bay, bringing twelve months' news of the outside world to Coral Harbour, whose inhabitants learned that for many months they had been unwitting subjects of a new king.

The delinquent magneto was entrusted to John Ell, the leading figure of Southampton Island and one of the two Eskimo recipients of the Jubilee Medal, and he gave a good example of Eskimo intelligence and dexterity by restoring it to a working order. John Ell had many years previously been employed by the R.C.M.P. on the mainland, who had renamed him after John L. Sullivan, the boxer. He was a pure-blooded Eskimo, though he maintained that his father was Captain Comer, a famous whaling skipper. A curious trait of the Eskimo is the willingness to claim descent from a white man, for they have no special respect for him as such, looking upon him as one who must be kindly treated since he is rather child-like and loses his temper very

easily. To trace their relationship one to another is to attempt an insoluble puzzle. They are devoted to children without apparently reserving a special affection for their own, and parents will often bring up a family of adopted children, allowing their own to be adopted by others. Although the word "husky" is generally understood to denote the Eskimo dog, in the country it denotes the man, and the dog is called a dog, there being but one variety.

The *Polecat* had beaten the *Nascopie* into Coral Harbour by nearly a week, and the south-east wind had brought in a quantity of drift-ice. A south-east wind in South Bay will bring ice from Foxe Channel round the shores of Bell Peninsula, and if the wind holds it will pack up towards Coral Harbour. The Eskimo welcome this; the walrus follow the ice, as they like to scramble out of the sea and bask on the pans, and dog food is then easily acquired. In previous years the ice had packed in so that the *Nascopie* has been unable to reach the post, but in 1936 it was not thick enough, and she arrived on August 24, piloted as usual for the last few miles by John Ell. She remained for fourteen hours during which the year's renewal of stock, handing over of furs, auditing of books, and other business was transacted.

Keeling was due to go out on the *Nascopie*. Two days before he left he had professionally assisted in a maternity case, and in appreciation the proud father had presented him with a handsome pair of white whale-skin boots. His place in the expedition was taken by Lieut. P. M. Bennett, R.E. Bennett had brought out a wireless transmitter lent by the Marconi Wireless Telegraph Company, but the cargo space of the *Polecat* was so limited that it was necessary to leave the rather bulky equipment behind at the post. It was proposed that the equipment should be transported to Baffin Island on the next year's ship, where it was hoped to make use of it.

Three days after ship-time the *Polecat* left Coral Harbour with Manning and Bennett on board. Baird and Rowley remained and later accompanied an Eskimo caribou-hunting party to Coats Island, some 90 miles farther south. Caribou was until recently plentiful on Southampton Island, but now there are only a few animals left, and a party goes to Coats Island every possible summer to get a supply of this delicious meat and the essential skins. There are some old Eskimo dwelling-places on Coats Island which Rowley was anxious to dig. Unfortunately this trip was accompanied by bad luck. The start was delayed by bad weather and soon after they reached the northern end of the island the Eskimo party succumbed to influenza. An epidemic is always to be expected at an Arctic post shortly after ship-time, and all the population, white and husky, go down. In the pure arctic air one loses the degree of immunization that comes in civilization from normal existence amongst disease germs, and on coming into contact with a carrier from outside one falls an easy victim. When an Eskimo gets ill he loses all zest for life and his one desire is to return home; so the party returned to Coral Harbour. Rowley was able to do some more excavating, whilst Baird collected a team of dogs and made preparations for their journey across the island to rendezvous with the *Polecat*.

The *Polecat* had had some difficulty in getting clear of the pack-ice, a good deal of zigzagging and ramming and pushing being necessary. One often had to jump off the boat and climb to a lump of ice many yards away, and then

push and cut, and persuade the lumps to close in to one another, leaving a narrow channel through which to manhandle the boat. There was a boat of Eskimo, off on a walrus hunt, leaving at the same time, and the two crews were able to render mutual assistance to one another. It was important to get to Bray as soon as possible as he was likely to be near the end of his food supplies.

The limestone coast of Southampton Island is practically devoid of shelter, and the water is very shallow for many miles out to sea, there being banks and rocks just hidden below the surface of the water. The *Polecat* reached the vicinity of Bray's camp on the afternoon of the second day and went firmly aground about a mile out from the coast. This was serious, as it was the last of the spring tides and the following high tide showed no signs of refloating the boat. Manning waded ashore at low water and located Bray, who had established two camps, the main one with most of his specimens being some miles farther along the coast. A strong inshore wind increased the effect of the next high tide, and the combined efforts of the three men were sufficient to get the boat into the deeper water. The next two hours were spent in a gluttonous feast for Bray's benefit, of which Christmas pudding and rum butter, cake, and chocolates were the main components. The camp was then struck and the boat moved down the coast opposite the second camp, where she promptly went aground, again on a falling tide, this time on a sharp ridge of rock amidships, on which she was left uneasily balanced with the bows several feet high in the air and the keel ominously bent. Strenuous efforts were made to right her, but it was found that the only practical course was to pack up the keel on either side of the rock, thus distributing the weight over a greater length, and await the next tide. The cases of skins and tins of pickled specimens were carried aboard and the *Polecat* sailed out of the Bay of God's Mercy, whilst overhead circled skeins of blue geese making preparations for their long journey to the Mississippi delta.

Having obtained an astronomical fix at Cape Kendall, a halt was made to obtain another fix some way up the west coast at a place where there was little shelter. An early equinoctial gale caused some anxiety; an onshore wind got up very quickly and both anchors were lost in getting the *Polecat* away. Some miles farther north a bend in the coast provided shelter, and here the boat was run ashore and made fast to a convenient rock, one of the anchors being recovered at a subsequent low tide. Another fix was obtained half-way up the Welcome coast at the mouth of a small river, in the creek of which the boat remained for ten days on account of the untimely ending of the spring tides. Some deer were sighted on a low limestone plateau and were strenuously but unsuccessfully hunted; there had been little meat available for some time, the larger birds having migrated, and seal hunting having proved a failure.

Whilst still some miles south of Cape Munn thick fog and snowstorm were encountered and the boat was soon among drifting ice. A strong onshore wind made it advisable to take shelter in a small bay, but the wind changed, and with the anchor dragging the *Polecat* was blown across to the opposite shore. The engine fired in the nick of time, but the canoe went the wrong side of a large piece of ice, and before it was clear boat, canoe, and ice were blown ashore and well swamped. The wind had brought in the drift-ice and formed

a solid barrier some 300 yards wide across the mouth of the bay. A day's axe work at low tides, and some hours of very strenuous heaving and cutting at high tides succeeded in clearing the way to the open sea.

An astronomical fix having been obtained at Cape Munn, the *Polecat* passed through Comer's Strait, which separates Southampton Island from White Island, whose steep granite hills in their fresh snow covering were a pleasing spectacle after the barren limestone flats of the former island. This channel had an evil reputation in whaling days and was supposed to be liable to whirlpools at certain tides, but on this occasion proved well behaved, and the *Polecat* safely entered Duke of York Bay. This bay was visited and named by Parry on his second expedition in 1821, and he described it as one of the finest natural harbours in the world; unfortunately it is icebound for ten months in the year. It was soon apparent that there was plenty of ice in the bay, but good progress was made through the leads. There were many seal, both square-flipper and netchek, on the ice, and a large polar bear was shot. Duke of York Bay is seldom visited by the Eskimo, who hold it in evil repute, but it is a fine hunting ground. The night was spent amongst the ice and proved a very cold one. The following morning the open leads were covered by an inch layer of new ice, and as it was obvious that a further advance towards the head of the bay involved a serious risk of being forced to winter there, the idea of obtaining a fix was abandoned. A two-hours' battle with the young ice so damaged the bows that it was decided to await a favourable wind to reopen the leads before attempting further progress, but before this decision was reached an overhanging ice-arch had caught the side stay and snapped the mast into two pieces.

Baird and Rowley reached the head of the bay on the day arranged for the rendezvous, having made a slow journey as there was little snow and most of the sledging had been over bare ground. It was now important to reach the mainland without further delay, for the fall had started in earnest and except for an hour at midday the thermometer remained well below freezing-point. The guardian angel of Duke of York Bay made a final disapproving gesture at the *Polecat*, for the painter parted after dark, and the canoe containing all the tents was carried away. The *Polecat* was now uncomfortably overcrowded with five men and twelve dogs, which had to be constantly kept away from the meat in the stem. The experiment of setting them ashore at night was unfortunate, as three ran away and failed to return. The engine on one occasion took thirty-six hours to restart.

On October 2 a suitable harbour was found on the mainland coast, a snow-house built, and preparations begun for beaching the boat and making the journey to the H.B.C. post at Repulse Bay. The ptarmigan migration was in progress and the appetizing meat of these foolish birds proved a useful adjunct to the food store. A light sledge was built from the broken mast and other spare pieces of wood, and on October 5 the party left for the Repulse Bay post which was known to be some 60 miles away, supplies for a three-days' trip being taken. The snow was still soft, and the granite country broken and rocky, the ice on the streams and lakes was unsafe, and the sea-ice impossible. The journey took nine days, of which the dogs went without food for seven, whilst the expedition subsisted on short rations of bannock. The tents were

somewhere in Duke of York Bay, and the snow too soft for building. A hole in a snow-drift with a sail cover for a roof provided the night shelter, but was very cramped. A dump was made of all but the indispensable articles, and the sledge was finally abandoned, the last day being completed without it. It proved, fortunately, to be a journey of a few miles only instead of the expected twenty. The Post manager had decided that it was too late in the year to expect the expedition, and that it must be wintering on Southampton Island; however his hospitality was more than equal to the occasion. Throughout the winter whenever any of the party were at the base, they were sure of a warm welcome from Joe Ford and as many meals as they could be persuaded to eat.

Besides the H.B.C. post, there is an R.C. Mission at Repulse Bay, and there was formerly a Revillon Frères trading post. H.B.C., having taken over the fur trade of the latter company, had surplus accommodation and were kind enough to place an empty building at the disposal of the expedition for use as a winter base. The remainder of the fall was occupied by short trips and preparations for larger ones. An astronomical fix was obtained and the surveyors practised theodolite work in the confined space of an igloo. When the thermometer registers 70° or 80° of frost it is not possible to get satisfactory theodolite readings in the open. By obtaining astronomical readings through the roof of an igloo, additional refraction errors may be introduced, but the micrometers do not stick, fingers remain unfrozen, and one does not hurry the work to get it done.

An order for dog food had been sent in a year previously, and 2000 lb. of Bovril Pemmican had been shipped. There was an unexpected supplement in the shape of some 2000 lb. of salmon which was bought from Eskimo in Gore Bay, where there had been an enormous autumn run. Six hunters had obtained some 20,000 lb. of fish and were thus able to feed themselves and their dogs and obtain oil fuel throughout the winter, with plenty over for others. Nevertheless it was evident that the winter dog food was quite inadequate for the expedition, and it was decided that two should go north to Iglulik at the mouth of Fury and Hecla Strait, where a plentiful supply of walrus meat was always available.

Bray and Rowley left Repulse Bay just before Christmas, accompanied over part of their route by Manning, who carried some of their stores, and reached Iglulik in the middle of January 1937. They later made a long trip along the south of Cockburn Land to Piling on the west coast of Baffin Island, and Rowley went on to Ponds Inlet to spend the summer excavating near there; Bray, having obtained supplies from Arctic Bay Post in Admiralty Inlet, spent the summer collecting birds at Fury and Hecla Strait. The main scientific work of the expedition was more fully described in an article in *The Times* (16 May 1938). Bray obtained more than four hundred specimens and Rowley's collections threw further and important light on the so-called Cape Dorset culture.

It had been intended to make an expedition from the head of Wager Bay through the Back river country to King William Island and on to Boothia Felix, and an order for dog food was sent in to both Wager Bay and King William Island posts. However a radio message was received stating that the supply boat from the Mackenzie river had been unable to get through the ice,

Frozen Strait, with White Island in the background

Near Committee Bay, May 1937

Canyon river, Southampton Island

At the mouth of Canyon river

and that the post was without supplies and could provide nothing. It was impossible to carry sufficient dog food from Repulse Bay and the trip had to be abandoned. Instead it was decided to make an overland journey to the head of Wager Bay and thence overland to the coast south of Cape Fullerton and on to Chesterfield Post to collect mail, returning along the Welcome coast.

The arctic winter begins about Christmas time, when the temperature drops to −40° F., and a steady 70°–90° of frost may then be expected for two months. The weather is normally clear and still at these low temperatures, and though there is but a few hours' daylight, travel is possible through the moonlit night. Sledging at these low temperatures is however slow work. A layer of mud about 1 inch thick and 4 inches wide is moulded on to the *komatik* (dog-sledge) runners; when frozen it is planed smooth and water is dribbled on and polished with a bearskin. If applied at the correct temperature this results in a thin layer of transparent ice which provides a frictionless running surface. Salt sea-ice and glare lake-ice will quickly remove the ice from the *komatik* runner, while the rough tide-ice at the edge of the sea and rocks concealed beneath the snow will break the mud layer; once a break is formed the remainder will flake away. It is necessary in the course of a day's run to re-ice the runners several times, whilst if the mud is broken it should be re-patched as soon as possible. Porridge can be used for this purpose if no mud is available. In the still midwinter weather the snow is covered with a layer of frost which quickly removes the layer of ice from the runners, whilst in March and April the sun will melt the black mud with amazing rapidity.

In January 1937, Baird and Bennett went to Ross Bay at the head of Lyon Inlet and obtained an astronomical fix. The longitude of that bay as obtained by Parry differed from that of the Fifth Thule Expedition by some 20 miles, and the correct value obtained with a wireless time signal was found to lie between the two, being about 8 miles from Parry's figure.

On February 3 Manning and Bennett with two sledges left for Wager Post. The ascent from Repulse Bay was gradual until the height of land about 1000 feet above sea-level was reached. This proved to be a featureless country dotted with rocky hillocks of broken gneiss rising about 100 feet above the general level of the country. The coast between Wager Inlet and Beach Point is of a similar nature, but here the general ground-level is just above that of the sea, and from the coast there is a gradual rise inland. This land crossing coincided with a cold spell, which made the going heavy, the thermometer remaining below −50° F. The caribou is still fairly plentiful in this locality and many tracks were crossed, though none was sighted. On the tenth day Bennett's sledge broke, having got out of control on a steep slope and crashed broadside-on into a rock. It proved irreparable, and the following night several dogs wandered off. The remaining sledge had to be heavily overloaded and made slow running. The following day a high steep range was sighted which proved to be the southern coast of Wager Bay. A descent into a steep-sided valley was made, and this swung north and ran out into a narrow bay some 6 miles in length, which in turn flowed into the main Wager Bay.

Wager Inlet is about 100 miles in length with a narrow entrance some

3 miles in width at its neck running into Roes Welcome. This channel remains open throughout the year, a great mass of drift-ice flowing in and out with the tides. Fifteen miles from the entrance the inlet broadens out into a bay some 15 miles in width, and from this point the sea is frozen over. The southern shore is generally higher and more precipitous than the northern, and both rise from low hills at the entrance until they reach their maximum height about 60 miles west. Here there are precipitous bluffs on the southern shore rising to 1000 feet above sea-level, whilst the peaks a few miles inland are nearly 2000 feet high. Opposite these there is a prominent cliff of red gneiss on the northern shore, about 1000 feet high, which forms a landmark visible from all parts of the bay. This feature, known as Mackay Bluff, is unmistakable, as it is the only precipitous bluff on the northern shore. Twenty miles west of Mackay Bluff the bay divides into two, and at the head of the southern branch are the narrows which lead into the salt-water lake near the head of which the H.B.C. Post is situated. The entrance to this lake becomes a waterfall at low tides, and the channel remains unfrozen throughout the year. The lake is about 18 miles long and 2 miles wide, but, surrounded by 1000-feet-high hills, it appears narrower.

It was evident that the existing maps of Wager Bay were much at fault, and Bennett stayed there to survey whilst Manning made the second land crossing to Chesterfield. Bennett lived with the Eskimo who managed the H.B.C. Post, a minor outpost from Chesterfield, and did most of his travelling with Eskimo. Unfortunately the radio set had not stood the sledge journey and refused to work, so that a longitude at the head of Wager Bay was not obtained. This was particularly unfortunate, as it was apparent that the head of the bay was many miles too far west on the existing maps. Two fixes were later obtained near the mouth of the bay, and to these and to the latitude fix at Wager Post the traverses were tied.

Manning reached Chesterfield and found that they were without dog food and could only supply him with oatmeal for his dogs. He returned up the coast to the mouth of Wager, obtaining two astronomical fixes, and then made a trip into the Back river country west of Wager Post. He was short of dog-food and had continuous snow, which made the going heavy and the visibility bad, but he saw what he believed to be the estuary of Back river before returning.

By the beginning of May the bird migration had begun, snow buntings had been moving for some time, and a watch was kept for ptarmigan and duck. The seals spent the day basking on the ice in the sun, with a wary eye on the horizon, ready to slide down a nearby hole with surprising speed should an enemy betray himself. The sun very soon melts the snow off the dark rocks, and by the middle of the month it is slow work sledging in the middle of the day when the snow is slushy. By this time there is perpetual daylight and all astronomical observations must be from the sun. During May, Baird made a trip overland, crossing to Committee Bay and up the west coast of Melville Peninsula. This coast is a steep gneiss ridge and rises about a thousand feet, but the islands half-way up the coast are limestone. Bennett returned to Wager Inlet with a sound radio, running a traverse down the Welcome coast and up the narrows of Wager Inlet, where two fixes were obtained.

The Repulse Bay survey was completed by astronomical fixes at Beach Point and the south-east point of the bay. The whole of the coast-line is gneiss, but there are considerable variations in its appearance. Beach Point, where the bay opens out of Roes Welcome, is a low point consisting of gneiss outcrops and a series of raised beaches of broken gneiss. On rounding Beach Point a further cape with a hill some 600 feet high is seen a few miles along the coast. This is Parry's Hope's Advance; far beyond it the bay opens out to the west. The hilly coast-line continues in a smooth sweep for 30 miles until the northern shore of the bay is reached. On this shore the land is lower but more broken, whilst there are many bays and fiords. The H.B.C. Post is in a small cove sheltered by a group of islands between the points of Aivalik [1] and Nowia.[2] A dozen miles farther along the coast is a group of islands known as Harbour Islands, used as a winter base by the whalers. At the eastern end, Haviland Bay runs some miles inland and is the commencement of the land crossing to Lyon Inlet. From the head of this bay there is a straight, almost unbroken, stretch of coast-line to the south-east point of Repulse Bay, with cliffs and steep slopes to a height of 600 feet, and only at two places can a sledge get inland.

From the south-east point of Repulse Bay the coast runs east-south-east for 20 miles to Cape Montague, which is separated by a narrow strait from Vansittart Island, which consists of a range of hills running south-east for 20 miles. This stretch of coast-line forms the northern boundary of Frozen Strait, the 15-mile-wide channel that separates White Island from the mainland and belies its name by never freezing, except at its southern entrance between the south of Vansittart Island and Cape Bylot on Southampton Island, where it does freeze once in a dozen years. It is however crammed throughout the winter by a mass of broken ice moving up and down on the strong tide. The tide in Frozen Strait and Repulse Bay rises and falls by some 12 feet, which is twice as much as at Chesterfield and is presumably caused by the meeting of the tides round either side of Southampton Island. The coast between Repulse Bay and Cape Montague is very broken with many islands, and a plane-table triangulation between two astronomical fixes was carried out. On this coast the *Polecat* had been left to winter, and by the beginning of June preparations were being made to get away. A visit was made to Parry's Winter Island and a fix obtained to check his longitude.

June is quite the best month in the arctic. Everywhere is the tinkle of melting water and the *chic-chic-chi* of the Barren land squirrel, who sits bolt upright on a pointed stone to bask in the sun. Where but yesterday was a patch of snow there is a clump of purple saxifrage, and this is soon joined by many other flowers. The birds lose no time over their family rearing. On June 19 a clutch of young longspur several days old was found. A summer expedition misses this spate of activity; it is essential to winter in the country to enjoy it. In July however one is tormented by myriads of mosquitoes, and

[1] Aivalik: Eskimo for Walrus Point. The Aivalik Eskimo were formerly grouped around Repulse Bay, but are now spread from Iglulik to Chesterfield and on Southampton Island.

[2] Nowia: Eskimo for gull. Dr. Mathiassen excavated on this point.

by August one feels that a snowstorm may be expected any day, and that the fall is once more round the corner.

For eight weeks the expedition remained on the north shore of Frozen Strait, watched the ice move backwards and forwards with the tide, and never had a chance of crossing. The ice-bridge farther down the Welcome again proved itself unfriendly, for this year it formed and delayed by many weeks the southward flow of the drift-ice. A forced delay of this nature is very exasperating, for one cannot go far from the boat in case a sudden storm should temporarily open up a lead. This eventually did happen, and after one false start, as a result of which the *Polecat* remained some twelve hours in the drift-ice protected in a small cove in an ice-pan from the pressure, a crossing was made to the north-western end of White Island. A few hours later the ice again closed in, and although progress was made a few miles down the coast, the boat again became ice-bound in White Whale Sound and remained for ten days. However Parry's Passage Island which had disappeared from the modern map was re-established, and the map of Frozen Strait completed by a survey of the White Island coast and an astronomical fix.

On August 1 another storm cleared the ice off the shore for a few days, and a crossing was made to Cape Welsford on Southampton Island, where a fix was obtained. White Island and the north-east coast of Southampton Island are high broken ranges of gneiss. There are many small coves in which a whaleboat may shelter, and a strong current sweeps down from Foxe Basin and keeps the sea open right into the shore throughout the winter. Life was scarce in this granite country, and there seemed few seals in the sea. There were shoals of white whales, but none were shot.

The *Polecat* reached Canyon river some 20 miles down the coast before the ice again closed in. After living on a diet of gull for a fortnight a net in the mouth of Canyon river provided a fine haul of salmon which proved an excellent change of diet. An astronomical fix was obtained at the mouth of this river.

Baird and Bennett, who were returning home, left the *Polecat* on August 13 and walked overland to Coral Harbour, where they persuaded John Ell to take them to Chesterfield. The ice eventually cleared away and Manning was able to take the *Polecat* down to East Bay before freeze-up, and the next summer he reached Cape Dorset. Baird and Bray returned in 1938, intending to reach the west coast of Baffin Island *via* Iglulik, and somewhere on that coast they hoped to meet Manning.

A GEOGRAPHIC RECONNAISSANCE IN NORTHERN MAYALAND

SIDMAN P. POOLE

IT is the purpose of this paper to summarize a few of the results of an expedition made early in 1938, under the auspices of the Syracuse University Museum of Natural Science, to some of the old Mayan city sites of northern and eastern Yucatan, particularly to that of Coba. The expedition proposed to study the environment of the ancient sites, the ruined causeways connecting them, the possible routes south to the earlier Mayan centres in the Guatemala region, and to search for any accessible quarries, cenotes, and other landscape features that might throw some light upon the Indian cultures from a geographic viewpoint. In addition it was hoped that collections might be made of the local flora and that fossils might be found that would be of value, inasmuch as this latter field especially has scarcely been touched in Yucatan.

The Yucatan peninsula is a great block of limestone: soft, white, and porous. Its horizontal strata, largely marine in origin, were lifted vertically out of the ocean in Pliocene and Pleistocene time. With the exception of an east–west anticlinal ridge, south of Uxmal, the surface of the northern half of the peninsula is an unbroken stretch of perfectly level plain, nowhere more than a few score feet above sea-level. The western or Gulf shore is extremely shelving, while the eastern or Caribbean side rises in abrupt bluffs from the water's edge. In all the land there are no known deposits of any of the useful metals, and such gold and copper as was found in Mayan possession at the Conquest must have come from Mexico proper or from some of the Central American sources.

Over the whole area there is a complete absence of streams, and the only bodies of fresh water are to be found in the deep, steep-sided cenotes (sink holes) and in the shallower solution depressions known as aguadas. Tangled and dense jungle covers all uncleared tracts and merges southward into typical rainforest. The rainfall, occurring almost wholly in the summer months, increases to the east and south, from 40 inches annually in the neighbourhood of Merida to 80 inches and more in the mahogany tracts of British Honduras. Everywhere underfoot is a thin red residual soil, explaining the brick-red pigment used by Mayan artists to depict land, while their picturesque name for their homeland—"land of the deer and turkey"—is justified by the frequent occurrence of these creatures in the thorny jungle.

It is not possible in these few pages to attempt any detailed study of the Mayan culture or of its history.[1] We know that it was extremely complex; great strides having been made in mathematics and astronomy, architecture and sculpture, religion and agriculture. Settlement in northern Yucatan

[1] For the classical survey of these topics see Stephens, John L., 'Incidents of travel in Central America, Chiapas and Yucatan,' 2 vols., New York, 1841; 'Incidents of travel in Yucatan,' 2 vols., New York, 1848.

The numerous volumes of the Carnegie Institution cover the recent work that has been done in Yucatan very fully and ably. For a summary of Mayan culture and history see Gann, Thomas, and Thompson, J. Eric, 'The history of the Maya,' New York, 1931.

seems to have been fundamentally rural in character and based, like all great cultures, upon agriculture. Maize, then as now, was the chief crop, and this was cultivated after the annual burning over of the trees and weeds from off the milpa or field. Domestic animals were unknown and hand tools of wood, bone, and stone were the only ones used. Scores of city sites lie buried in the Yucatan bush, only a few of which, such as Chichen Itza and Uxmal, have been partly cleared and excavated.

These population nuclei seem to have served only limited functions in the life of the Mayas, and they certainly lacked many of the characteristics of the modern urban agglomeration. They were not in any sense manufacturing centres nor were they ever but very limited distributing points. They were the residences of the chiefs or rulers, but they do not seem to have served as citadels or centres of resistance. While a considerable trading activity may have characterized the ancient plazas, the cities on the whole were mainly the great religious centres for the people. They combined some of the features we associate with a medieval monastery, with its throng of monks and servants, together with those of a holy shrine whereto crowds of devout pilgrims came periodically, as to Benares or Mecca or Jerusalem.

The expedition first visited the easily accessible and partially restored cities, Chichen Itza and Uxmal, and then from Valladolid, the eastern terminus of a narrow-gauge, wood-burning railroad, proceeded with a train of sixteen mules into the jungle to their principal area of study, the region around Coba. The trails used by Bennett[1] were followed, going in by way of Chulutan and coming out *via* Chemax.

A stay of several days was made at Coba, camping on the shores of Lake Macanxoc, which lies in a solution depression or aguada. The forest with its very dense undergrowth made travel difficult and movement was limited almost solely to trails that could be run by compass and cut with machete. A longer stay with a larger company to clear off mounds and causeways would, with little doubt, yield interesting results. The group of known sites at Coba is impressive and covers a more extensive area than either Chichen Itza or Uxmal. Since they have never been adequately mapped, and since nearly every party stumbles upon hitherto unknown mounds or stelae at varying distances from the "civic centre," it seems fair to assume that this must have been one of the greater Mayan urban agglomerations.

By the lake a small clearing had been made by the chicleros, and in it was a wall-less thatched shelter which served our muleteers quite adequately. The expedition brought its tents, cots, and food, and lived in comparative comfort. There is no food to be had in the neighbourhood, the nearest Indian huts being 20 miles or more away, and the jungle devoid of much game save a few deer, wild turkey, and pigeon.

The principal building at Coba, known as El Castillo, is a high pyramid with a small but very well-preserved temple on its truncated top. The familiar figure of the "Diving God" appears over the doorway which fronts a more or less ruinous but still passable flight of steep steps down the southern façade. Traces of coloured plaster work are abundant on this little temple as

[1] Bennett, Robert R., "The ancient Maya causeway in Yucatan," *Indian Notes*, vol. 7, No. 3 (July, 1930), pp. 347–82.

well as upon El Iglesia,[1] which surmounts a less lofty pyramid rising from the shores of the lake.

About half-way between El Iglesia and El Castillo one of the most interesting discoveries of the expedition was made. Some few hundreds of yards south-west of the latter ruin, while cutting a trail to that building, the party stumbled upon one of the few known circular buildings that have been reported from the Mayan area. This structure was in a most ruinous state and completely overgrown with vegetation, but its ground plan was circular and the cornice, some 8 feet above the ground, could be traced a considerable way around its circumference. The interior had collapsed and was inaccessible, but doorways were in evidence. The diameter was approximately 30–40 feet and the present height somewhat less. Unlike the Caracol at Chichen Itza, there was no trace of this building having been erected upon a terrace.

Search was made throughout the area covered by the ruins for ancient quarry sites. As elsewhere in Yucatan, the rock here is a soft, porous limestone, cream coloured, and changing to reddish in places. Here and there marine fossils are abundant, and the formations, which are horizontal with little or no trace of disturbance, are probably Pleistocene. In no place are there more than a few inches of a reddish residual soil covering the bed rock. Time and labour limitations prevented a complete search of the environs of the ruins, and it is possible that stone blocks may have been carried for some miles down the numerous causeways centring at Coba. One cannot help feeling however that the Mayan quarries in most cases must have been close to their building sites: the stone used is found literally everywhere and there was no animal power to aid in moving it. With the water-table not far below the surface shallow quarries were likewise more than probable, and one such site seems to have been found just west of El Iglesia. The evidence is not entirely conclusive, but this is not surprising after centuries of erosion and plant life have rendered the area inconspicuous amidst its surroundings. Great outcrops of stone, possibly 6 feet high and roughly rectangular in shape, could however only be explained on the theory that the adjacent stone masses had been cut away, leaving these blocks standing above the level of the quarry floor.

All of the ancient cities were located close to sink holes or cenotes, which in most cases contained the only available water supply. This is true of Chichen Itza and Uxmal. Several cenotes of good size were noted in and near Coba, and at least four aguadas. Lake Macanxoc must be 1000 yards long and half as wide, and Lake Coba is approximately of the same area. This relative abundance and permanence of water may perhaps explain the greater apparent population and importance of Coba and also the fact that it seems to have been amongst the oldest of the Yucatan cities, antedating Chichen Itza by about five hundred years.

It is not altogether surprising that certain of the recent parties reaching

[1] A legend of this structure, El Iglesia, told the author by his Mayan muleteers, suggests that this building may have been used for some time after the Conquest for religious rites. In fact, both at Coba and at Izamal the presence of fire-blackened stones and of candle grease suggests that the ancient gods have not yet entirely lost their hold over the minds of their old followers.

Coba have disagreed as to the direction and number of the ancient causeways which seem to radiate from it.[1] Much clearing of the ground and careful mapping is the first essential to a thorough investigation of this highway nucleus. Causeways built up several feet above the general land-level and constructed of cut stone are quite numerous within the mound area, and several of them curve and otherwise change their direction. These variations, and the tangled jungle, have undoubtedly been the source of the apparent discrepancies reported in their pattern.

One causeway in particular was noted as heading due south from between Coba and Macanxoc. A seemingly well-informed and trustworthy chiclero who has spent sixteen years in the Yucatan bush insisted that this led through the jungle all the way to Guatemala, and that he had crossed it and followed it in several places. A causeway that may thus possibly link up the sites of the so-called Old and New Empires deserves more thorough investigation. It may be much longer and of more ultimate value than the causeway that connects Coba with Yaxuna, south of Chichen Itza.

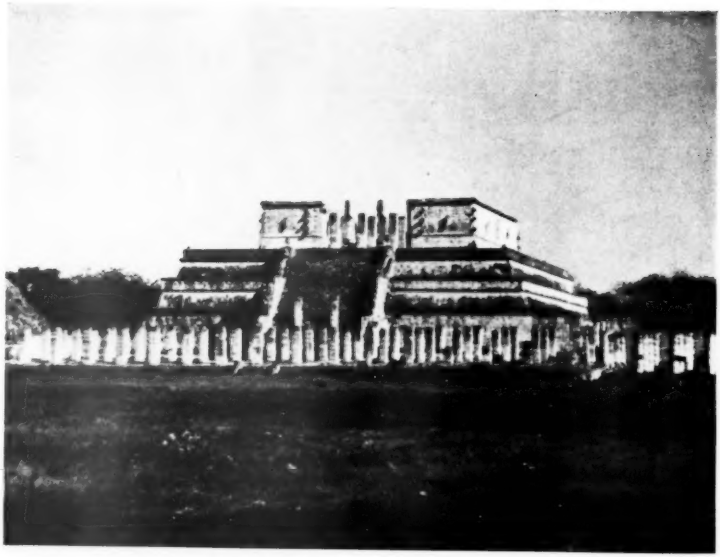
Since the Mayas had neither domestic animals nor wheeled vehicles, one cannot help but speculate about the use to which these highways were put. They mostly stretch in almost straight lines for scores of kilometres through the jungle. To-day they are shapeless, tree-covered mounds, but once they must have been highways, 25–30 feet in width and surfaced with a hard, white cement, and perhaps traversed—as Bernal Diaz[2] tells us were those of the valley of Mexico—by countless thousands of sandalled feet. The supposition that they were entirely for ceremonial purposes seems unlikely, and the more prosaic needs of war and trade may better explain their origin. Certainly war was at times frequent, and it is now known that Indian trade was more extensive and far reaching than had been thought probable. Diego de Landa states that trading was the favourite occupation of the Mayas, and mentions salt, cloth, and slaves as common products of exchange; stone counters and cacao beans were used for money.[3] There is other evidence from early Spanish explorers and from the presence in Yucatan of metals, precious stones, and obsidian (substances found only at long distances from Mayaland) that both by sea and by land these Indians carried on a diverse and considerable traffic. To picture the ancient causeways as "commercial channels" does not therefore seem to be stretching the imagination too far.

There is a similarity in the pattern of all the Mayan cities. The public structures, temples, terraces, and pyramids, were grouped around plazas or squares. These squares seem to have been the commercial cores, the centres for trade, for general assemblies, and for religious ceremonies. The causeways radiate in straight lines from these centres. Only at Tulum, and perhaps at a few other cities, have definite traces of military works such as

[1] For the disagreement over the causeways at Coba, compare Bennett, R. R., *op. cit.*; and Thompson, J. E., Pollock, H. E. D., Charlot, J., 'A preliminary study of the ruins of Coba, Quintana Roo, Mexico,' Carnegie Institution, Pub. No. 424, Washington, 1932.

[2] Bernal Diaz del Castillo (trans. A. P. Maudsley), 'The discovery and conquest of Mexico,' London, 1936, p. 271.

[3] Landa, Diego de, Friar (trans. Milliam Gates), 'Yucatan before and after the conquest,' The Maya Society, 1937, p. 37.



Temple of the Warriors at Chichen Itza

Mayan hut near Coba

The observatory at Coba

The causeway near Coba

walls been found.[1] Natural defensive sites such as hills, headlands, or river loops are either absent or very uncommon in Yucatan, and it is probable that the terraced temple served at times as a fortress.

In the bush around the plazas were to be found the oval, thatched-roofed huts of the common people. Countless humble mounds mark their sites, while the present-day hut of the native is fortunately a replica of that built by his ancestors. Footpaths led from hut to hut, connecting them with temple, causeway, and more particularly with the outlying milpa or corn field. The milpa system, which is still practised in Yucatan, necessitated frequent changes in home sites in order that field and labourer might not be too far apart. The many small mounds and rectangles of cut stone dotting the jungle around Coba, Izamal, Chichen Itza, and Uxmal suggest a considerable population, but in view of the frequent changes in home sites necessitated by their agricultural systems the population may have been much less at any one time than the number of mounds would indicate.

The number and size of the Mayan cities has given rise to much speculation as to the actual populations of these cities and of the country as a whole during the period of their occupance. Tulum is described by the earlier voyagers along the east coast as presenting an appearance not unlike that of Seville in Spain and the multitudes of warriors that the Conquistadores encountered, even though their number was greatly exaggerated, indicate a fairly dense population. It may be doubted however whether all the cities were occupied at the same time. Wholesale migration of Mayan groups, involving the abandonment of one city for another, seems not to have been uncommon. Aside from the well-known trek of the Mayas from the Old Empire cities of Guatemala to found those of Yucatan, there are other instances in point. Chichen Itza was abandoned after several centuries of occupance and again reoccupied after a long interval. The Itzas also fled southward from this city to Peten Itza after their futile resistance to the Spaniards in the sixteenth century. It is possible that such shifts were frequent and common. They may have been originally linked up with the practice of changing milpas upon the quick exhaustion of the soil, and this later may have had a religious sanction. Epidemics or wars also may have caused abandonment of cities, as may be inferred from the Mayan traditions prevalent at the Conquest and from the Itza flight mentioned above.

This population problem has other aspects. The thin soil and excessive drainage, together with the exhaustive agricultural methods, make it difficult to see how such large populations could have been supported. In this connection Dr. J. Russell Smith[2] has pointed out that amongst the Mayas all the food raised was utilized directly for human consumption. In communities where domestic animals are numerous a very large percentage of the food

[1] The pueblo of Izancanac, reached by Cortez on his expedition of 1524–25 to Honduras, is described as fortified with ditches, stockades, and stone watch-towers. See Means, Philip Ainsworth, 'History of the Spanish conquest of Yucatan and the Itzas,' Cambridge, 1917, p. 28. For the walls surrounding Tulum, see Lothrop, S. K., 'Tulum, an archaeological study of the east coast of Yucatan,' Carnegie Institution, Pub. No. 335, Washington, 1924.

[2] This remark was made in Cambridge, Mass., during the discussion on a paper (an abstract of the above) presented before the Association of American Geographers.

produced must go for the animals' use. Their absence in Yucatan may have been an important factor in enabling the Mayas to support themselves and yet have the leisure in which to become the master builders we know them to have been.

Solution of many problems in Yucatan may be hastened by the geographer's fieldwork, his viewpoints, and his methods. Further search for ancient quarry sites could be profitably carried out, and the causeway leading south from Coba should be traced to its terminus: over such a route may have first come the seeds of the Mayan culture.

THE CAYMAN ISLANDS

A. J. A. DOUGLAS

A number of cruising liners now call during the winter at the Cayman Islands, and it is hoped that the following notes may prove a useful supplement to other information available.—Ed. *G.J.*

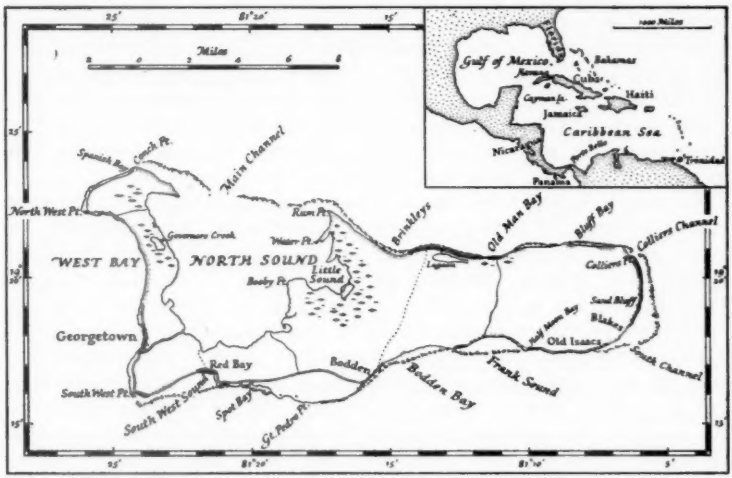
THE Cayman Islands, Grand Cayman, Cayman Brac, and Little Cayman, form one of the two dependencies of Jamaica and are from 110 to 159 miles distant from the north-west corner of that island. They were discovered by Columbus on 10 May 1503, when returning from Porto Bello in Panama to Hispaniola, and named by him Las Tortugas from the number of turtles he saw there. Their present name may have been derived from caymans or alligators, which, although now non-existent, were possibly found there by the early settlers, but a more likely explanation derives it from Cay Mano, "the island like a hand," and the shape of Grand Cayman would justify such an explanation. As regards Cayman Brac, Brac is apparently synonymous with "bluff." The Caymans were never occupied by the Spanish, but settlers from Jamaica found their way there and their numbers were no doubt augmented from time to time by shipwrecked sailors. In 1734 the islands were formally colonized and proclaimed a British possession by Governor Modyford. His memory is preserved in the name Muddy Foot Bay.

Between 1734 and 1741 many patents of land were issued, and the patentees were obliged to take with them to the islands a certain number of white men as well as their negro slaves. During the Napoleonic wars Grand Cayman was attacked by the Spaniards from Havana and the capital, Georgetown, was destroyed. The invaders were driven out, but to guard against other such attacks several forts were built, the remains of which can still be seen. A regiment called the Cayman Island Militia was also raised, and was not disbanded until 1838. It was remarkable in that the officers were not appointed by Government but elected by the men themselves. The islands were visited on many occasions by buccaneers, and there are traditions of more than one buried treasure. Gold coins have in fact been discovered and the natives are fond of telling how men suddenly became rich in this manner. In 1832 the local Parliament or Assembly of Justices and Vestry met for the first time.

This body functions to this day under the presidency of the Commissioner appointed by the Colonial Office. He is under the orders of the Governor of Jamaica, who confirms the decisions of the Vestry before they can become law. The Commissioner besides being Chief Executive Officer is also Judge, Collector General of Customs, and Treasurer.

The present population of the islands, something over 6000, is of mixed European and African blood, but very many of the people are noticeably fair, especially the women, some of whom seem to show strong traces of Scandinavian origin. Of recent years many of the islanders have married United States subjects, and in this way United States influence is steadily growing.

The climate of the islands is hot in summer, the mean temperature being about 84° F., but the autumn and winter are comparatively cool, and in the



Grand Cayman

early morning the temperature often falls below 70° F. From October to May the north-east trade wind persists and a cool flow of air makes conditions very pleasant.

Turtle-fishing takes pride of place among industries, the turtles being hunted on the cays off the Nicaraguan coast and brought back by the island schooners to Cayman, where they are turned loose in crawls. These are large shallow areas of water enclosed by wooden fencing, always situated where there is a plentiful supply of turtle grass on which the Chelonians can fatten. The green turtles are eventually shipped to England and America, but the Hawksbill variety, which provide the tortoiseshell of commerce, are killed and the shells removed. The shipping of the green or edible turtles involves a certain degree of cruelty, as the turtles are turned on their backs and the flippers are pierced and lashed with rope or palm fibre to prevent them beating themselves to death. Salt water is poured over them at intervals, but of course no food can be given them although they remain alive for many days.

The only other important industry is the making of rope from the twisted fronds of the palmetto which grows wild throughout the islands. This rope, although not so strong as manilla, is very resistant to the action of salt water and is in great demand in many of the other West Indian islands. Some millions of fathoms are exported annually and almost every family in the islands can be seen twisting rope in its spare time.

Cattle and horses are raised locally and the usual tropical vegetables and fruit are cultivated.

Practically every able-bodied man is, or has been, a seafarer. As soon as they can walk the boys start sailing model boats, and by the time they are in their 'teens can handle the local cat boats, craft about 20 feet long, pointed at each end and built of island timber, fitted with one mast carrying a mainsail and jib. These boats are usually painted in bright colours and are fast sailers, being used for fishing generally with a crew of two men. All the island schooners used for turtle-hunting and general trade are built locally; in fact the natives are famous boat-builders and, with the many varieties of hardwood that grow on the islands, turn out vessels of very sturdy construction. The local mahogany is used for keel, ribs, and knees, and owing to the prevailing wind the trees provide naturally bent timbers of immense strength. Decks are built of manchioneal, which is in many ways better than teak.

Revenue is derived from import duties, a poll tax, taxes on schooners and canoes, on cattle and horses, and harbour dues levied on visiting shipping. On 1 January 1938 there was an estimated surplus of £8747 and a reserve fund of £6000. The present Commissioner, His Honour A. W. Cardinall, has utilized part of this to improve the roads and to erect in each village a strongly constructed building to be used as a reading-room and library and also to form a safe rallying-point in case the islands should be visited by a hurricane as they were in 1933. Great damage was then done to property, and some lives were lost in Grand Cayman, where at one place the sea nearly swept across the island. In Georgetown, the capital, a new post office has also been built on a scale surprisingly lavish for such a small community. These buildings have been erected by the islanders without outside assistance, coral limestone being used for the walls and native wood for the roofs. The results reflect great credit on the builders: the plans were simply sketched out after a concrete floor had been laid and everything afterwards was done by eye.

Public health is good and there is a resident medical officer appointed by Government: the inhabitants are long-lived and infant mortality is low. Apart from the ordinary diseases to be found in any community the only prevalent complaint is hookworm, which attacks many of the young children.

The islands are connected to Jamaica by a fortnightly mail service. Trading schooners running to Jamaica and Florida also take a few passengers, but the accommodation is very limited. Before leaving Jamaica for Cayman early in January I was assured that I would not find the voyage a very comfortable one, and this was amply borne out: the *Cimboco*, 113 tons, which carries the mails once a fortnight to and from Grand Cayman, is about 110 feet long, fitted with Diesel engines, and has about eight small cabins for passengers. At sunset we slipped down the placid waters of Kingston harbour and passing Port Royal set our course along the south coast of the island. Directly we left

the sheltered harbour the little vessel began to roll and most of the passengers retired. Next morning found us in smoother water off the lovely shores of the Pedro plains and the Black river estuary. About one o'clock we passed Point Negril, the extreme western end of Jamaica, and set a north-west course for Cayman Brac. By ten o'clock a full gale was blowing from the north-east and we wallowed along in acute discomfort, sleep being almost out of the question. Dawn was breaking over an ugly sea as we approached Cayman Brac, where we dropped anchor in comparative shelter.

Cayman Brac is the highest of the three islands, having along its entire length a rocky ridge, about 150 feet high at the eastern end and gradually dropping almost to sea-level at its western extremity. It is 10 miles long by a mile wide and like the other islands is covered with fairly dense vegetation. Small settlements are scattered round the shores and we visited several of these, landing and embarking passengers and cargo in rowing-boats. About noon we crossed the 7-mile channel which separates Cayman Brac from Little Cayman and here the process was repeated. Little Cayman is very sparsely inhabited and most of it is virgin jungle. The land is very low, not rising more than about 40 feet above sea-level. Both here and at Cayman Brac the 100-fathom line comes very close to the shore. I was told by one of the natives that in both islands the Black Widow spider is found, and walking about after dark is sometimes dangerous.

Having finished our business we started in the afternoon on the last lap of our journey, the 60-odd miles to Grand Cayman. For the rest of that day and until about three the following morning we rolled and pitched unceasingly. Under the lee of Grand Cayman we reached smoother water and at 5 a.m. we dropped anchor off Georgetown.

As the sun rose the surroundings took shape and I realized what an attractive place Georgetown is. The little town lay trim and inviting, half smothered in tropical vegetation. Several island schooners lay at anchor and one by one white-sailed boats put out from the harbour to the fishing grounds. I had remarked at both the other islands how clear the water had been, and here it was the same: the deeper water was every shade of blue, purple and mauve, while the shallows were jade green; and looking down from the ship's side I could see masses of coral, sandy patches dappled with sunlight, and waving sea fans amongst which shoals of fish threaded their way.

I had arrived just before the annual regatta, which is the most important event of the year in Grand Cayman. For a week all business is practically suspended; people from the outlying districts flock into Georgetown dressed in their best and swell the crowds that gather round the harbour to watch the schooner and boat racing. The Commissioner kindly invited me to accompany him in his car, and in this way I saw most of the island that could be reached by road. The roads are of course by no means first class; there are many holes and deep sand drifts, but in spite of this a good average speed is possible. In this island, which is 17 miles long and from 2 to 7 miles wide, there are about 40 miles of made roads, most of them skirting the coast. The north-western part is deeply cut into by a shallow extent of water called the North or Great Sound, some 63 square miles in extent and more than 6 miles across; this at first makes the topography rather confusing to the stranger. The interior of

the eastern end of the island, with an average width of 3 miles, is a wild and in parts almost unexplored tangle of vegetation, while underfoot the coral rock is honeycombed with holes and bristling with sharp points which soon cut through the stoutest boots. Here and there are shallow lagoons of muddy brackish water, most of them apparently connected to the sea by underground channels: in fact the whole island, which nowhere reaches a height of more than 50 feet, is nothing but a huge coral sponge. The vegetation is luxuriant; flowering shrubs and creepers abound while the cottage gardens blaze with hibiscus, poinsettia, bougainvillaea, lilies of several varieties, and huge sweet-scented orchids which are found wild in the jungle. Mango and breadfruit trees are common and pawpaws have been planted round the houses. Birds of many kinds sing by day and the nightingale by night. Insects are not very numerous and there are no wasps. There are two varieties of harmless snakes, many lizards, rats, mice; and in the jungles agouti, which the natives call rabbits, and which were at some time imported from Central America and now exist in large numbers. Between Georgetown and the settlement of West Bay to the north there are over 5 miles of pure white sands ideal for bathing.

After the regatta was over and the island life became normal again, I found more comfortable quarters about a mile out of the town. Living is cheap in Cayman, and the cost of board and lodging is about £2 10*s* per week.

My real object in visiting the islands was sea-fishing and I soon found that I had come at the right time, as the kingfish season was at its height. These fish, which the Americans call wahoo, are beautifully shaped surface feeders, living chiefly on flying fish, and were to be caught by trolling cut-bait or a metal spoon: they frequently run up to 80 lb. in weight and their flesh is excellent eating. For £7 a month I hired a cat boat and the services of two men and went out fishing almost every day. I never came back empty handed, for if the kingfish would not bite I could always catch barracouta, whose teeth are so much feared by the natives of the Caribbean.

Being anxious to see the north side of the island I took boat across the North Sound to a settlement where I stayed for four days. The Sound is very shallow and most of the bottom is covered with turtle grass, while the east shore is a maze of small islets and mangrove swamps. Near the mouth on the east side, at Rum Point, there are extensive sandy shallows where one can see enormous starfish, scarlet, orange, and brown, and hundreds of the lovely conch shells so common to these islands. I had heard of a lagoon which very few people had ever seen and, after some difficulty in getting a guide, arranged to visit it. After going some distance by boat inside the reef which here fringes the beach we struck inland and at once encountered obstacles. The going was very rough; the coral rock, full of holes and bristling with sharp pinnacles, was in places quite rotten and the utmost care was necessary. Many of the trees and bushes through which we had to force our way were poisonous, in particular the manchioneal, whose leaves if bruised cause acute blistering. Another and smaller tree, called by the natives "Maiden Plum," exuded a black juice; some of this soaked through my stockings and stained the skin, which in a few days sloughed off leaving raw patches which took some time to heal. When we at last found the lagoon it was most difficult to get near it, as it was surrounded by dense mangroves and black and evil-smelling mud. On

the open water we could see duck of at least two varieties, and tarpon and perhaps other fish broke the surface, while in the mud we found snapping turtle or terrapin. We got back that evening very tired and covered with gashes and lacerations from the thorns and the razor-edged coralline-limestone. Some of the more accessible lagoons, particularly one on the road between Georgetown and Boddentown, were very pretty and full of land-locked tarpon running to about 20 lb., which would give great sport to any one equipped with the proper tackle.

THE FIRST STEAMSHIP IN ARCTIC EXPLORATION

FOR some six years we have shown in the Museum, but have never described, two massive relics of the first steamship which ever went on an Arctic expedition: the *Victory* which sailed in 1829 under the command of Captain John Ross, R.N., with his nephew James Clark Ross as second in command. These relics were presented by Mr. William Gibson, Hudson's Bay Company Inspector in King William Island, who had bought them from the Eskimo. A piece of heavy riveted boiler seam and flange was brought by a hunter from Sheriff Harbour on the east of Boothia peninsula; the flat piece of boiler plate belonged to a family living on the isthmus. The plate, about 25 by 14 inches, had been hammered slightly concave and for a long time used by the Eskimo as a seal-oil lamp. A thick coat of hardened oil, which had preserved the metal, was removed by Mr. Gibson.

One of the main points in the plan John Ross submitted to the Admiralty in 1828 was the advantage which steam would confer in ice navigation. He failed to secure official approval, but was able to obtain financial support from Mr. Felix Booth, one of the Sheriffs of London about that time. After examining various ships for sale, he finally bought at Liverpool the packet-boat *Victory* which had formerly been employed in the Isle of Man service. His 'Narrative of a second voyage . . .' contains some account of the machinery with which the ship was fitted, but much more of the trials and disappointments of which it was the cause.

The original burthen of the *Victory* was 85 tons, but "by raising five feet and a half on her, she became capable of carrying a hundred and fifty tons, including the engine and the necessary complement of provisions. . . . The engine was made by Braithwaite and Erickson, being a patent contrivance; and the paddle wheels were so constructed that they could be hoisted out of the water in a minute. There was no flue; instead of which, the fires were kept in action by bellows, and it was, of course, a high pressure engine, the boilers of which were heated by pipes passing through them, in a manner now sufficiently familiar."

Ross seems never to have had great confidence in this machinery, and before the vessel had left the Thames in May 1829, he recorded the "grossly negligent conduct of our engine-makers," and the departure, at Gravesend, of "the constructors of our execrable machinery." The boilers were soon

found to be leaking, and the temperature of the engine-room proved to be too much for the men. The narrative of the preliminary voyage round to Port Logan is devoted almost entirely to the defects of the engine and the attempts to overcome them. When running, the performance of the engine was unsatisfactory: "Even with a pressure of forty-five pounds on the inch, we could never obtain more than fifteen strokes in the minute; and as it thence followed, that the outer edge of the paddles had no greater velocity than five miles in the hour, that of the vessel could not possibly exceed three."

Though severe on the workmanship, Ross was ready to admit that the principle was "judicious": "The diminutions of weight, and the removal of inconvenience, caused by the omission of a funnel, constituted a manifest advantage; and a still greater one was the reduced consumption of fuel involved in the plan of this newly contrived engine. And while the plan of lifting the paddles out of the water, and thus out of the reach of eventual ice, was well suggested, so was the execution of this part of the machinery correct, even to superfluity, since we were enabled to take away the counterpoises and guide rods, and thus to diminish both the weight and the trouble."

Despite all the attention and time bestowed on the engine on the voyage up Baffin Bay, it proved of little service, though on occasions, by employing one paddle only, they were able to ply to windward. When in Lancaster Sound Ross notes on August 5 that the engine was kept in action about twelve hours, "the longest period during which it had yet worked without accident or interruption." Again, in making their way through the ice down the Gulf of Boothia, they succeeded on one occasion, by alternatively steaming and warping, in proceeding along shore against wind and current. In the last weeks before reaching their winter quarters however they had ceased to regard the *Victory* as anything more than a sailing vessel, for "whatever advantage we had latterly derived from our machinery, it was not greater than we might have obtained from our two boats, by towing. But, thus rendering us no service, the engine was not merely useless: it was a serious encumbrance; since it occupied, with its fuel, two-thirds of our tonnage, in weight and measurement." On September 30 therefore arrangements were made for taking the boilers to pieces, with the intention of landing them when the ship was frozen in for the winter. Within a few days the *Victory* went into winter quarters at Felix Harbour, just south of Sheriff Harbour, and by October 20 the last of the engine had been put ashore: "While it was incumbent on us to store it up, though it would in reality be difficult to say why, were it not from that habit, or feeling, which rebels against absolute wastefulness, I believe there was not one present who ever again wished to see, even its minutest fragment."

Ross's last comment on the unhappy engine, made ten months later when leaving Felix Harbour, would seem to have been justified in the event: "It was probable that the Esquimaux would profit for a long time to come, by the *cachés* of Messrs. Braithwaite and Erickson."

THE TREND OF GRAVITY SURVEY

EINIGE SCHWEREVERHÄLTNISSE IN DÄNEMARK. By G. NÖRGAARD. Copenhagen: Geodetic Institute, 1939. Meddelelse No. 12. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 35 pages; diagrams and charts*

THE Geodetic Institute of Denmark, under the directorship of Professor N. E. Nørlund, has become a pioneer in gravity measurement on land and sea. It owes much to the genius of Mr. G. Nörgaard who, after developing a static gravimeter for use at sea in surface craft, has now brought to a successful stage a new static quartz gravimeter for use on land.

The new instrument, described in "Ein statischer Quarzschweremesser und Schweremessungen" (Danish Geodetic Institute. *Medd.* 10, 1939), was the subject of a brief note in this *Journal* for July 1939 (p. 92). It is a three-pronged fork of quartz with points upwards, the centre prong being rigid and vertical, while the outer prongs, very slender save for bulbous swellings near their top ends, are slightly inclined inwards. There are thus two symmetrically disposed astatic pendulums and the distance apart of their two pointed ends, read by a vertical micrometer microscope, is a sensitive measure of the force of gravity. The systematic response of each member to this force depends on accurate levelling of the base: the pointed and rigid centre column acting as a control. When the instrument is levelled the three prong points are equally spaced, but whereas the distance of either sensitive prong from the rigid one depends upon this levelling, the distance between the two sensitive ones is unaffected by a slight dislevelment. The instrument appears to have some advantages over the Holweck-Lejay gravity pendulum, with which it has much in common, the first being the static and the second the dynamic form of the same thing. The balance and symmetry of the Nörgaard arrangement and its construction in one piece of fused quartz are in its favour. As the new instrument is not highly dependent on levelling (it may be stood on a plate carried on three pegs driven into the ground and operated by the observer and one assistant) its reading is rapid; it demands no accessories; it is light enough to be carried in one hand; it is apparently robust enough to be unaffected by transport in an ordinary motor car over long distances; and even a road collision did not alter its performance.

The chief initial difficulties in the new technique were to provide adequate damping and to avoid electrostatic forces and temperature effects. All these have been more or less satisfactorily overcome by immersing the working parts in a fluid, at the first trials nothing more than water. The damping is said to be so good that observations can be made near traffic. Differences of temperature between the upper and lower thermometers rather than absolute temperature are said to necessitate a correcting term in the formula for gravity, but its significance is not quite clear, for we are told that the effect of small convection currents is not serious as the container is effectually lagged.

The Geodetic Institute has lost no time in getting full value out of the new instrument. In the second half of 1938 and the early part of 1939 no less than three hundred new gravity stations distributed over the whole Jutland peninsula were observed, and the results published within a few months.

Static gravimeters have, as is well known, been developed and used for a decade or more by oil and other prospecting companies, but instruments and results have, unfortunately though perhaps not unnaturally, been withheld from the public view, even of the scientific world. The precision of gravimeters

approaches one 10-millionth part of the quantity measured, and they suffer from the disability common to all ultra-precise measuring apparatus that no reliance can be placed on the reading unless it be frequently checked for drift. In the present case drift rarely exceeded 1 milligal per day, but some wise precautions against systematic error were nevertheless taken. A network of nine well-scattered primary stations in Jutland was first, carefully and with considerable repetition, observed with the new gravimeter, being connected also with Copenhagen through two other stations. The network was adjusted and showed the mean error of a single gravity observation to be 0·25 milligal. Five comparisons with earlier pendulum observations showed a maximum difference of but 1·5 milligal and no systematic tendency with respect to the magnitude of g. Since even in the best of circumstances pendulum observations have a mean error approaching 2 milligal, these results are very satisfactory and are encouraging to any authorities thinking of extending their national gravity surveys economically.

Most of the secondary stations were observed in closed loops of 10–15, each loop taking a day or two, and each starting and closing with one of the primary stations. In the single month of July 1938 the Jutland peninsula was thus covered with a network of 150 stations at a mean spacing of about 15 km. Later a further 150 stations at some ten times the density were observed in a special area. This rapid campaign has produced a convincing gravity-anomaly map of Jutland full of interest and future usefulness. On the general map the lines are drawn at intervals of 5 milligal and on the special maps at 2 milligal. With the land observations are shown the values of gravity at sea around Denmark already obtained by Mr. Nörgaard, and the hitherto assumed precision of the latter, 1–2 milligal, is confirmed. The most conspicuous features of the general map are a broad positive anomaly in the centre of Jutland and a very steep gravity gradient equal to 4 or 5 milligal per km. across the northern end of the Öresund, the narrow strait separating Denmark from Sweden. This, we are reminded, accords with the fact that the Palaeozoic floor has been found, both by geological and seismic research, to be 1500 metres lower on the Danish side of the sound than on the Swedish.

A gravity anomaly at any one place has some interest and value, but is in itself no more than an isolated clue. Fifty gravity stations scattered at random, one station for each 4000 or 5000 square kilometres, possess little more than a value proportionate to that of the one. Increase the density of distribution of the stations by ten times and suddenly the whole assemblage springs to life as a picture and its value becomes immeasurably greater. Such is the present publication. Behind it is the realization that the complete and intensive gravimetric survey of a country is both scientifically and economically justified. New information becomes available for the geologist, the geodesist, and the geophysical prospector. In the present case the correlation of gravity gradients with anomalies of the vertical already found has both confirmed past work and suggested future work.

After discussing the broad features of his gravity anomaly map the author says (the original is in German): "Finally the correlation between anomalies of the vertical already known and the gravity results which we have found is of the greatest geodetic interest. Unfortunately only north–south components of the deflection are known. One sees the beautiful agreement of the deflections both as regards direction and magnitude . . . to the north and south of the Silkeborg gravity maximum; . . . One might say that the great deflection at Uranienborg (on the Swedish island of Ven in the Öresund) had already demonstrated the great gravity gradient there."

Minima flanking a maximum, and negative gravity-gradients in general, are often closely connected with valuable mineral beds; such irregularities in the gravity map direct attention. The author concludes: "One can therefore say that from the gravimeter standpoint Denmark appears to offer quite good possibilities of mineral beds."

The money necessarily spent on geodetic survey, geological survey, and mapping will soon find everywhere a modest counterpart in a few hundreds of pounds spent annually upon national geophysical surveys, in the forefront of which will be intensive gravimetry and its astronomical complement, the determination of local anomalies of the vertical. The newer techniques of gravimetry, so well exemplified in the present publication, and happily in this case made available freely to the scientific world, will bring this consummation within the realm of practicable things.

Mr. Nörgaard's instrument has something in common with that of Mr. Ising (see *Bull. géod. int.*, 28 (1930) 556–76), in which a rigid pendulum is carried by a stretched horizontal quartz fibre that bears its whole weight; and this may have introduced complicated strains in the quartz fibre. The somewhat similar instrument constructed by Threlfall and Pollock in 1899 had the further disadvantage that large torsions were applied to the fibre. If an instrument depends upon the elasticity of quartz it seems indispensable that the strain shall be kept everywhere quite small. The Nörgaard instrument fulfils this condition admirably. A change of gravity makes only a minute alteration of shape in the quartz body and the small gravity strain is distributed smoothly though not evenly over the deformable parts. The proof of its practical value lies in the remarkable survey of Denmark already made with it. The same result could never have been achieved with the gravity pendulum, which requires at least ten times as long to operate and cannot produce a survey of gravity in which isogams at 2 milligal intervals can be drawn with confidence. Geodesists must give as much constructive thought to the modern gravimeter as they have in the past to the gravity pendulum. One may even now ask whether the gravity pendulum, with its complicated technique and none too great precision, will not soon be superseded in the fundamental gravity comparisons, though two pendulum stations are required to standardize the instrument. One thing at least is clear: An exhaustive test of all modern gravimeters should be made by one or more competent authorities, to compare the Lejay astatic pendulum, the new Nörgaard instrument, the gravimeters depending on the properties of helical springs and developed mostly in secret, and finally the Nörgaard and Halck patterns of hydrostatic gravimeter

H. L. P. J.

REVIEWS

EUROPE

THE GENERAL ASPECTS OF THE VEGETATION OF EUROPE. By MARIETTA PALLIS. *London: Taylor and Francis, Ltd.*, 1939. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches; 66 pages. 3s 6d*

The chief merit of this work consists in some useful observations by the author on the vegetation of Romania, details relating to the degraded vegetation of the Norfolk Broads, and observations on the vegetation of Greece, with a summary of Lazos's work on the forests of Thessaly and Epirus. The extracts from Colonel W. Martin Leake's papers are also of value. Otherwise the book is a mixture of extracts from published works and summarized conclusions, the latter without always very clear supporting evidence. Much stress is laid on "The Animal," and especially man, in modifying the vegetation, and this is pressed to an exaggerated degree. The book is by no means easy to read as the style is far from clear. A. H.

ALBION: an artist's Britain. By STEPHEN BONE. *London: Adam and Charles Black, Ltd.*, 1939. 11×8 *inches;* $x+154$ *pages; illustrations in colour. 15s*

Mr. Bone sets down the elements of the British landscape as they appeal to an artist, explains clearly and forcefully how they have evolved, and links this exposition to his personal experiences while travelling through the countryside. He conveys incidentally to the reader what the landscape painter is attempting and how he sets to work, and adds brief notes on the pictures reproduced, an aspect of the book which might well have been enlarged. In his text he ranges widely, drawing upon physical geography, climate, and social history to explain the landscape as it appears to-day. He occasionally generalizes a little freely, but this does not materially affect his theme, and by the end of the book the reader will have gained an understanding of the continuity of country life and its expression in field and hillside, in farm, village, and town. If the final impression he leaves is that of a mode of life which is passing away, he does not indulge in unbalanced strictures. The futility of attempting to transport urban ideas into a rural setting, thus destroying the features of the older order which prompted the attempt, is clear to all, and he pillories the more banal results only. The reproductions of his water-colour paintings are no mere haphazard addition, but an integral part of the book. He has chosen perhaps aspects of the landscape which allow him to indulge his sense of colour, and the softer tones and greys more characteristic of Britain are unrepresented. They however emphasize the range and variety of the landscape, and provide a contrast to the sketches of industrial areas. G. R. C.

HIGHWAYS AND BYWAYS IN THE WELSH MARCHES. By S. P. B. MAIS. *London: Macmillan and Co.*, 1939. 8×5 *inches;* xxxvi+324 *pages; illustrations (by Joseph McCulloch) and map. 7s 6d*

HIGHWAYS AND BYWAYS IN ESSEX. By CLIFFORD BAX. *London: Macmillan and Co.*, 1939. 8×5 *inches;* xvi+360 *pages; illustrations (by F. L. Griggs and S. R. Badmin) and map. 7s 6d*

Mr. Mais's impressionistic style makes this volume more colourful than others of the series. His plan is to describe a number of itineraries giving a lively account of wayside incidents and the character of the scenery. In this manner he takes us through all the English and Welsh Border counties and into the

wild country of Radnor Forest, the Black Mountain, and the Brecon Beacons. There is a good deal about the history of the great Border castles typified by Ludlow, and so great is the author's interest in Stokesay, near Craven Arms in Shropshire, that he even confesses to have written a book on this castle before he had seen it. Light is thrown on the enigmatical Ladies of Llangollen "whose very elusiveness keeps them alive." As in other regions of exceptional natural beauty in Great Britain the Welsh Marches have in places been badly disfigured by nineteenth-century industrialization, and the author's interest in social questions leads him to make some observations on this subject, especially on Merthyr Tydfil, which occupies what was once a wild and lovely mountain valley where to-day one can hardly distinguish slag-heaps from mountains. Tribute is paid to the magnificent valleys of the Wye and Usk, but it might have been mentioned that much of this beauty depends upon exquisitely green meadows and, very notably in the case of the Usk, upon splendidly proportioned trees. Scientific precision is hardly looked for in a work of this kind, but what exactly are we to understand by the sweeping statement that the park of Powis Castle, at Welshpool, contains the "tallest trees in the British Isles"? Presumably these are elms, but the species is far from clear from the accompanying drawing. It is a pity that the Malvern Hills which form so rugged an outpost of the Welsh highlands are not referred to, since they partly lie in one of the Welsh border counties.

In contrast with the above Mr. Bax's contribution is essentially historical, so much so that the author in places seems to forget the countryside in his zeal to relate the historic interests of church, inn, mansion, and castle. He expresses indebtedness to the *Essex Review* and 'Place-names of Essex.' It is stated that the people of Essex are superstitious, and that belief in witchcraft in some villages was strong even at the end of the nineteenth century. There is sufficient reference to landscape to revive memories of the finely forested tracts in the south-west, the pleasant hills of the north-west, and the wild marshes of the estuaries of the Crouch and Blackwater. Mr. Bax makes no exaggerated claims on behalf of the scenery of Essex which he regards, perhaps rightly, as below the average of English counties in natural beauty. On the other hand he very rightly attributes the charm of the county to a rusticity which persists to within a surprisingly short distance of London. The county too possesses a somewhat distinctive geographical personality with marked peculiarities of climate.

The description of Epping Forest as a hornbeam wood needs qualification, for though this species is abundant as smaller growth, this forest, as well as Hainault and Hatfield, is predominantly of oak with beech on the high gravel eminences about the clays. L. C. W. B.

THE STORY OF MERSEY AND DEESIDE ROCKS. By DAVID E. OWEN. *Liverpool: Philip, Son and Nephew—London: George Philip and Son*, 1939. $7\frac{1}{4} \times 5$ *inches; 142 pages; illustrations and sketch-maps. 7s 6d*

This little book by Dr. Owen deals in a fascinating way with the general geology of the Liverpool district. Apart from a time sequence its ten chapters avoid the stereotyped geological treatment and pass easily from one theme to another. Interspersed with the main body of the work are brief descriptions and explanatory accounts of some important theoretical considerations, the formation of coal and lead, mining, etc., which make the text pleasant reading. The specialist may disagree with some of the generalisations, but these are unavoidable with the limitations of space. There are three appendices dealing with local rambles, publications on Liverpool geology, and some hints on taking up geology as a hobby. An index is also included.

Whilst mainly intended for general reading the book would also form, for the serious student, a useful introduction to the geology of the Liverpool district. It is well illustrated with plates and diagrams, and the only serious deficiency is the lack of a suitable geological map. As the book is mainly intended for the general reader this seems an unfortunate omission. W. G. V. B.

THE HISTORICAL GEOGRAPHY OF THE SHETLAND ISLANDS. By ANDREW C. O'DELL. *Lerwick: T. and J. Manson ('Shetland News' Office) —London: Land Utilisation Survey*, 1939. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xx+328 *pages; illustrations and maps.* 12*s* 6*d*

This book is substantially a thesis accepted by the University of London, preparation of which has obviously involved great labour and much research in little known and somewhat inaccessible quarters. The lists of references are indeed formidable. Perhaps the worst that can be said of it is that it has the defects of its qualities. As is not altogether unusual in regional theses, the author in his anxiety to tell all that he knows of his subject tends to overload his pages with detail, some of which at least is relatively unimportant. His volume however is a storehouse of information on most aspects of life and work in Shetland and fills a distinct gap in the geographical literature of Scotland.

Mr. O'Dell divides his book into three sections. The first, on the physical habitat, is not particularly illuminating; the chapter on the physical background is rather inadequate, while his parochial descriptions contain so much miscellaneous matter that it is sometimes difficult to know what end he has in view. The second section, "Aspects of development," occupies rather more than two-thirds of the book and is by far the most interesting and important. Not only are agriculture, fishing, and the other pursuits of the people described with a wealth of illustrative detail, but there are very useful sections on the distribution of population, the port of Lerwick, the tourist industry, and other matters. In this and in the succeeding section, "Historical review of the development," we have some account of the political and economic changes which help to explain the chequered history of the Shetlander during the last few centuries. The *udal* system or system of peasant proprietorship introduced by the Norse gave place to the Scottish overlordship, which opened the way to the subdivision of crofts in order to increase the number of fishermen, and later to clearances in order to increase the number of sheep. The economy of the Shetlands was disturbed by external no less than by internal changes. The *haaf* or deep-sea fishing suffered by the competition of Aberdeen, and at a later date the loss of the Russian market and the introduction of the large steam drifter which the Shetlander could not afford brought about a big decline in herring fishing as a native industry.

The author has made a praiseworthy attempt to notify the region of which he writes by having his book printed and published within it. The printing itself is good if not attractive, the more simple and diagrammatic maps are clearly reproduced, but the illustrations of scenery though well chosen are not worthy of so scholarly a book as this. J. Mc. F.

THE RISE OF MODERN INDUSTRY IN SWEDEN. By. G. A. MONTGOMERY. (Stockholm Economic Studies No. 8.) *London: P. S. King and Son*, 1939. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* viii+288 *pages; railway map.* 10*s* 6*d*

This study in economic history is particularly worthy of the attention of geographers, for it is written with a very real appreciation of both space and time relationships. Although it might seem trite for the author to remark, in the concluding section, that "besides the human factor and the natural resources other forces were, on the whole, of a more secondary importance" in the rise of

modern Swedish industry, yet too many historians take these two factors for granted.

The book is divided into five parts of varying length, the last being a short conclusion. The first part deals with the economic organization of Sweden before the rise of modern industry. Sections on the early organization of agriculture, the iron industry, and the timber industry, claim the particular attention of the geographer. The effects of differing natural conditions on the outward aspect of the villages and the lay-out of the surrounding land are briefly but clearly discussed.

The second part deals with the beginnings of modern industrial organization up till about 1870. It is much larger than the previous part, and includes an account of population growth wherein the value of the early established census organization in Sweden is clearly brought out. In the agricultural sphere the effects on land utilization and on the cultural landscape of the various *skifte* (enclosure) and *avvitring* (redistribution) movements are dealt with. In this part, as also in the third (on the progress of industrialization, 1870–1914), much space is naturally given to the growing export industries grouped under the heading of iron and timber. In the third part also an increasing amount of space is devoted to the improvements in social organization, and the "deproletarianization" of the workers, movements which have undoubtedly affected the outward aspect of Sweden as well as its economic organization.

The fourth part discusses developments since 1914, and the author asks whether Sweden can continue much farther along the path of rapid industrial expansion and be able to maintain her privileged position in the face of the international disturbances in the economic and political fields. F. H. W. G.

GREEK EARTH. By SIDNEY HOPPER. *London: Michael Joseph*, 1939. $9 \times 5\frac{1}{2}$ *inches; 286 pages; illustrations. 12s 6d*

NEWS OF PERSEPHONE. Impressions in Northern and Southern Greece with a car, a kettle and cameras. By DOROTHY UNA RATCLIFFE. *London: Eyre and Spottiswoode*, 1939. $9 \times 5\frac{1}{2}$ *inches; x+224 pages; illustrations and sketch-maps. 12s 6d*

The first part of Mr. Hopper's book is devoted to Athens; there is a description of a tour on foot in Attica to Marathon, which ended at Oropos; and the last half is occupied with a ramble, again on foot, through the villages of Aeolia, which took the author to Khalkis, Thebes, and Delphi. His opening chapter, which concerns the Balkans as a whole and is one of the best, establishes his title to serious consideration, for he seems to have grasped the racial, political, and economic intricacy of the structure of Balkan society. He cannot avoid speculating about the future, and hazards a guess that the Balkan renaissance, if it comes, may assume a specifically Slav complexion. He finds in the peoples of the Balkans—"Europe Minor" is the term he prefers—a relic of what he calls "barbaric goodness," akin perhaps to the "savagery" that Havelock Ellis found so attractive in Spain and that appeals to citizens of more ordered countries. After this chapter the rest of the book is rather disappointing; there are acute observations, especially of Greek character, but no ability to portray the country through which the author passed; and there is perhaps too much classical learning. The style, in the skill with which odd-shaped words are selected and made to fit, is reminiscent of a stretch of dry-walling; and as entertaining. The traveller who has not yet been to Greece will turn rather to Dorothy Una Ratcliffe. Her book, though slighter in many ways than Mr. Hopper's, is the work of a skilled and sensitive writer, who went to Greece for the spring, and found the countryside "as beautiful to-day as it was in the years when it was

loved by the ancient gods." Her travels were extensive, for she went by car, covering the Peloponnese (some of her best descriptions are of Navplia and Burchi) and north as far as Edessa and Thessalonike. Her tracks crossed Mr. Hopper's by Delphi; he was inspired to two chapters on oracles and sacerdocy, whereas Miss Ratcliffe at Arakhova was mainly interested in the flowers. These and gipsies are her chief enthusiasms; and whatever may be said about the latter, her book will certainly appeal to lovers of flowers. It is also very pleasantly illustrated with her own photographs. J. P. H. M.

INVITATION TO ROUMANIA. By DEREK PATMORE. *London: Macmillan and Co.*, 1939. 9×5½ *inches;* xii+158 *pages; illustrations.* 10*s* 6*d*

EASTERN CARPATHIAN STUDIES. Roumania. Edited by H. J. FLEURE and R. A. PELHAM. 80 *pages*. South Carpathian Studies. Roumania. II. Edited by H. J. FLEURE and E. ESTYN EVANS. 58 *pages. London: Le Play Society*, 1936 and 1939. 10×7½ *inches; illustrations and maps.* 2*s* 6*d;* 2*s* 9*d*

These two Le Play Society volumes and Mr. Patmore's account of his travels are, within their limits, complementary. Mr. Patmore spent a few months in the country in 1938, visiting mainly the country houses of the aristocracy. The Le Play Society visited Romania in 1933 and again in 1936, concentrating its studies on two small regions in the East and South Carpathians. Mr. Patmore's peasants are all poets and those other aspects of their daily lives in which the Le Play Society is primarily interested do not concern him. The Society for its part pays scant attention to literary circles in Bucureşti or to the cosmopolitan landowners whom Mr. Patmore accompanied to their country estates. He went to the capital first and then ranged over Moldavia, Transylvania, the Dobrogea, and Bucovina, but his book is not a "social study of a little known people" in any but a most restricted sense of the word "social." He was enthusiastic about everything he was shown, but was handicapped by knowing little Romanian; which may account for the banal comments and judgment that is often naïve. His style, for one who several times describes himself as a "young writer," is not very encouraging. The chapter on the Bucovina, headed "The Byzantine heritage," refers to Byzantine civilization as "now forgotten." By whom?

Descriptions of the villages of Corbu and Curtea de Argeş form the core of the Le Play Society's work; the one a mountain community in an Eastern Carpathian district of mixed Romanian and Szekler settlement, whose self-sufficiency is being gradually undermined; the other, typical of rural Wallachia, in an almost entirely Romanian area, an important focus of peasant life, with fairs, a pottery industry, not lacking evidences of modern development, though most generally known for its Armenian-style cathedral (here dismissed under the heading "princely and religious associations"). In both cases settlement is carefully described, with plans of the villages, of individual houses, details of agricultural routine, and (in the case of Curtea de Argeş) an interesting plan of the fairs. Sheep are the pivot of rural economy in Carpathian lands, and migration to the upland pastures enabled their people to preserve some sense of unity and their language. As adjuncts to these studies there are scattered accounts of the geology, climate, and vegetation of the regions; also of Romanian economy. Much repetition could have been avoided by issuing these studies in one volume, graced by the map and Professor Fleure's excellent introduction to the European setting which accompanies the later volume.

Mention should be made of the photographs in the Le Play Society's studies; though not of the level of technical excellence reached by those illustrating Mr. Patmore's journeys, they well display those aspects of the day-to-day life of the villages which the Society sets out to study. J. P. H. M.

ASIA

MINARET AND PIPE-LINE. Yesterday and to-day in the Near East. By MARGRET BOVERI. Translated from the German by LOUISA MARIE SIEVEKING. *London: Oxford University Press*, 1939. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xvi+422 *pages; map and sketch-maps.* 21*s*

This book by the Stockholm correspondent of the *Frankfurter Zeitung* was written more than a year ago, but for some reason not stated was only published shortly before the outbreak of war. It is brought up to that date by an introduction.

The author begins with a charming description of the elements in the East —trees, flowers, desert, hills, water, and sun: elements which, she remarks, condition everything created by man. Then follows a history of the Near East, from the earliest Sumerian, Semite, and Elamite city-states to the Great War. In that area of the war the leaders were not mere cogs in a complicated machine, with no life of their own, like their comrades in the West, but were individuals developing in the continual demand for leadership, as also in the legends which grew up about them. The war in the Near East was like a last remnant of the Middle Ages. The second half of the book is devoted to an account, not very accurate, of the tangled skein of oil diplomacy in the Persian Gulf, and to an admirably objective description of the post-war Turkish and Arab States. On the whole, the author is fair to Britain: the book could hardly have been published in Germany to-day. She speaks of the splendid work done in 'Iraq and of our popularity in the Persian Gulf, and affirms that England is still the Arabs' best ally. The translation is excellent. E. H. K.

BURIED EMPIRES: the earliest civilizations of the Middle East. By PATRICK CARLETON. *London: Edward Arnold and Co.*, 1939. $9 \times 5\frac{1}{2}$ *inches;* 290 *pages; illustrations and maps.* 10*s* 6*d*

This interesting book attempts, with some success, the hardest task of an archaeologist or of a historian: to write history with mainly archaeological material. For though there are many thousands of separate documents, and some of these have been found lying in some relation to one another, the historical scheme into which they have to be fitted must be constructed on a stratigraphical and typological comparison of illiterate remains, and in constant view of the peculiar geographical and ethnological factors. On the other hand, out of the copious records of routine—contracts, prayers and hymns, records of victory over enemies often less known than the conqueror—emerge here and there vivid forcible personalities (Naram-Sin, Gudea, Hammurabi) of whom it is possible not only to write as of living men, but to estimate their contributions to civilization.

The scale of Mr. Carleton's book will be appreciated from his initial announcement that "only one area will be dealt with, and only one period in the history of that area—the earliest one." The area extends from the Taurus and the Isthmus on the west, to the Indus valley; for it is no longer possible to write of Sumerian culture without comparison with its Indian counterpart, and discussion of their relationship; and now there are intervening glimpses both of some parts of Iran and of the steppe borders north of it. Asia Minor, on the other hand, remains almost outside Mr. Carleton's scope; partly because the archaeological record there is still fragmentary, though rapidly gaining coherence through recent Turkish excavations; partly because historical events beyond Taurus hardly begin before the close of Mr. Carleton's story. The "Hittite Empire," though it began some centuries earlier, hardly took an intelligible part in international politics before about 1600 B.C.

Before that "imperial age," when Egypt also intervenes in Western Asia, the theatre of historic events was restricted. Intruders arrive from beyond, but the civilization of Mr. Carleton's "Primitive Age" was essentially self-contained (except for that far Indian counterpart already noted), however the rulers of cities and kingdoms within that civilization might quarrel and devastate each other. And it is the upbuilding of that essentially "Sumerian" mode of life that Mr. Carleton has tried to extricate from the Mesopotamian material.

He calls his work a "text-book," and it does give the essential outlines and processes very clearly; at the cost of dispensing with footnotes and almost all references. But his scholarship is sound, and he has expert advisers; he has a feeling for country and modes of life not usually displayed by orientalists; he has gathered an immense amount of information into a modest compass; and he knows when to warn us that what he puts forward is speculative or controversial, and why. How rapidly the whole subject is growing may be illustrated from an appendix on the new material from French excavations at Mari, and its revision of dates in the nineteenth and twentieth centuries, including that of Hammurabi himself. For the lay reader however what matters is the order of events and the general perspective; and even for professional historians Mr. Carleton's book will be a convenient and often suggestive *aide-memoire* for some time to come. J. L. M.

TRANSASIEN: 23,000 kilometer mit 32 PS von Palästina bis China. By MAX REISCH. *Leipzig: F. A. Brockhaus*, 1939. $9\frac{1}{2} \times 6$ *inches; 200 pages; illustrations and route-maps. M.7.50 (unbound M.6.80)*

This is a straightforward non-scientific account of a journey from Jerusalem to Shanghai. The journey was remarkable in that it was all performed in one vehicle, a 32-h.p. 4-cylinder Steyrwerke light lorry, which survived the deserts of 'Iraq and Iran, the mountains of Afghanistan, and even the jungles of the Burmese–Indo-China frontier. The good humour and deliberately non-heroic resourcefulness of the two young Austrians who carried the venture through seems to have been proof against even the rigours of petty officialdom. The journey was made before the invasion of Austria, but published after it, and it is interesting to note how the author's naturally care-free account has been doctored in places so as to reproduce the right spirit. On the whole the author seems to appreciate the very friendly reception afforded to him all along his route, especially by the representatives of the various oil companies that sped him on his way. There is a particularly interesting description of the 'Iraq Petroleum Company's pumping-stations-cum-guardhouses along the desert road between Damas and the Euphrates. The most difficult and, for the motor enthusiast at least, the most interesting part of the journey was from Mandalay to Hanoi, through the Shan States, with a description of life among the devoted American missionaries at Kengtung.

There is nothing of special geographical value in this book, and its many inaccuracies, especially in regard to Iran and Afghanistan, would pain the pedant, but the narrative is light-hearted and easy, and the ninety photographs are of outstanding excellence. W. V. E.

PEAKS AND LAMAS. By MARCO PALLIS. *London: Cassell and Co.*, 1939. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches; xx+428 pages; illustrations and maps. 18s*

Mr. Pallis's book describes journeys in Garwhal, Sikkim, and Kashmir. Although in each case the expeditions took the form of mountaineering journeys, as such creditably carried out, the dominating feature of the book is the interest in Tibet and things Tibetan. The number of scholars who have written about

Tibet is still small. Particularly amongst the English there has been very little learned interest in the culture of Tibet, although Sir Charles Bell's sympathetic understanding of the Tibetan people will long be remembered with gratitude.

In spite of Mr. Pallis's knowledge and learning, the authorities have so far always refused him permission to enter the country of his affection. This is an unfortunate fact; but it is to the author's credit that he makes no complaint. A reviewer may nevertheless express the hope that the clear merit of this book may cause any future application by Mr. Pallis to enter Tibet to be favourably viewed. Fortunately for us there are many Tibetans outside the political frontiers of their country with whose assistance it has been possible to study their country's culture.

Numerous beautiful illustrations help to make this book a very important contribution to our knowledge of the Tibetan way of life and thought. No other exposition is so successful in conveying the gospel of Tibetan Buddhism, which embodies so much thought spread over a wide expanse of Asia beyond the boundaries of Tibet that the book should be studied by any reader interested in Central Asia. Those familiar with the usual roads into Sikkim, Garwhal, and Ladak will find much that is interesting and entertaining in Mr. Pallis's account.

M. A. S.

LAND BELOW THE WIND. By AGNES KEITH. *London: Michael Joseph*, 1939. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 318 *pages; illustrations and endpaper sketch-map.* 12*s* 6*d*

Mrs. Keith, who is an American, married a British officer of the North Borneo Civil Service and went to live in Borneo, without previous experience of the tropics. Her imagination and sympathy soon enabled her to master that oblique control of an Asiatic household which can alone combine friendliness with moderate efficiency. Her lively interest in every aspect of life, and her sense of humour, made it possible for her to find amusement, if not enjoyment, in the attacks of mosquitoes and fever, the depredations of white ants and silver fish, and all the inevitable discomforts of a hot damp climate. She describes her experiences with an accuracy born of keen perception and the aptness of American idiom.

She devotes half her book to the account of an expedition which she and her husband made through the districts of the east coast. This little-known jungle country is as hard as any in the world, but Mrs. Keith has not made it abundantly clear that she met with exceptionally bad weather and that the discomforts of jungle travel may be mitigated by a less Spartan traveller than her husband. Nevertheless her inherent honesty saves her from both exaggeration and understatement, and she succeeds in holding the reader's interest through the monotonous recurrence of rain, sandflies, and floods.

She wisely confines her book to an account of North Borneo as she experienced it, and makes no attempt to be generally informative. Such figures as she gives are not invariably accurate, nor is the Malay with which she sprinkles her narrative above criticism, but she has achieved what she set out to do, and gives an honest and entertaining account of her daily life in a country which she has come to regard as home.

O. R.

CHINESE HUNTER. By J. WONG QUINCEY: foreword by LIN YUTANG. *London: Robert Hale*, 1939. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 384 *pages; illustrations and sketch-map.* 15*s*

Mr. J. Wong Quincey was for twenty years a member of the teaching staff of Tsing Hua University, the American "Boxer Indemnity" college in the environs of Peiping. It is unusual to meet a Chinese who is addicted to shooting as a

sport. But the gun and rifle were Mr. Quincey's hobby; and in this book he writes of his experiences on shooting expeditions to the hunting grounds familiar to the foreign sportsmen of North China, the duck and snipe marshes in the Peiping neighbourhood, the haunts of pheasant, goral, pig, and roe deer in the Shansi mountains and the Peiping hills, and the wild-sheep country of the Mongol borderlands, where bharal and big-horned argali are found.

Mr. Lin Yu-tang contributes a foreword, telling us who Mr. Quincey is; that he was (before being driven from his home by war) Professor of Shakespearian Drama at Tsing Hua University, that he is an inveterate lover of the gun, and that he owes his curious patronymic to the nickname bestowed by General Gordon on his father, who was a native of Quinsan. The majority of readers will probably agree with Mr. Lin that Mr. Quincey's random observations and his descriptions of places, things, and people in and around the old capital of China and the Western Hills are of greater interest than his accounts of pheasant, duck, and big-game shooting. He writes with an agreeable simplicity, and with a remarkable command of English.

Mr. Quincey's reminiscences will certainly recall to many former Peiping residents the charm of outdoor winter days beyond the walls of old Peiping, and shooting expeditions to the Western Hills, the peak we used to call "Mount Conolly," the pilgrims' mountain, Miao Feng Shan, the rugged country round the Nankow pass, the Wall, winding its snake-like way across the hills, the Shansi mountains, happiest of hunting grounds, and over all the clear and bracing air of the North China hills—echoes and memories of life and times that are for ever past. E. T.

AFRICA

THE EXPLOITATION OF EAST AFRICA, 1856–1890: the slave trade and the scramble. By R. COUPLAND. *London: Faber and Faber*, 1939. 9 × 5½ *inches;* x + 508 *pages; illustrations and map.* 25*s*

This volume continues the historical narrative begun by Professor Coupland in 'East Africa and its invaders' (*Geogr. J.* 93 (1939) 534). In it Seyyid Barghash succeeds his father Seyyid Said as the chief character, or rather he shares that position with John Kirk. The first portion deals with the final attack upon the slave trade, the success of which was ultimately due to Livingstone, Kirk, and Barghash. In cooperating in this work, Barghash, quite legitimately, was influenced by his desire to secure British support in maintaining his territorial claims on the mainland. The object of Kirk's official life was also to secure and extend British influence in East Africa, but it was his fate to witness first the loss by British interests, notably in connection with the Mackinnon concession, of several promising openings to this end, and secondly the loss by the Sultan of practically the whole of Zanzibar territory on the mainland. The story of the establishment of Germany in East Africa is related here in great detail, in part from hitherto unpublished material, and the extent to which the future of East Africa was dependent upon the fluctuations of international politics in Europe is clearly brought out.

This volume makes even more interesting reading than its predecessor. The complicated story is handled skilfully, and is supplemented by illuminating character sketches. The author does not hesitate to criticize severely where this is justified, for example in dealing with Stanley, but maintains a balanced judgment throughout. His book may be warmly recommended to those confused or disturbed by much of the current criticism of British imperialism. Having now dealt with the invaders and exploiters of East Africa, it is to be hoped that Professor Coupland will continue with the story of the East Africans themselves. G. R. C.

AN ECOLOGICAL SURVEY OF THE MOUNTAIN AREA OF BASUTOLAND. By R. R. STAPLES and W. K. HUDSON. *London: Crown Agents*, 1938. 13×8½ *inches; 68 pages; illustrations and maps.* 10*s* 6*d*

The ecological survey is relatively new as a means of demonstrating the potentiality of land and the errors in its utilization. As far as practical results are concerned it has its opponents, because it is sometimes claimed that in countries where populations have existed for centuries, the good land has been discovered and developed, so that surveys can do little more than confirm and enlarge what is already known. In Africa however a sufficient answer to such criticism can be found in recent ecological surveys such as those carried out in Tanganyika by the tsetse research department and in Northern Rhodesia by the agricultural department, and in the one now under review, all of which have thrown much light on the effects of cultivation, grazing, afforestation and deforestation, and soil erosion.

This study, financed by the Colonial Development Fund, was carried out in response to a suggestion made by Sir Alan Pim after his recent inquiry into the financial and economic position of the country. It is particularly interesting for the human geographer because Basutoland is one of the very few parts of Africa where the native population is rapidly increasing. The mountain area, to which the survey is restricted, is pastoral in character, and G. R. Staples, who had previously carried out research on the grasslands of Tanganyika, was able to gather a quantity of information in the four months devoted to the survey. He was assisted by W. K. Hudson, surveyor to the Basutoland Public Works Department, who has also reported separately on the mountain bridle paths, the only means of transport in a land of pack-horses rather than motor cars. In addition, F. A. Venter, from the South African Geological Department, joined the survey for a month and contributes ten useful pages on the geological background.

In this instance ecology has been used to solve a practical problem; for not only does the original natural vegetation of the mountain area comprise some of the richest pasture land in South Africa, but it is also the most important part of the main watershed. Until near the end of last century the grazing capacity of the mountains proper was used very little by the Basuto, but since then there appears to have been an increase of stock, especially sheep and goats, to nearly three million in 1921, nearly four million in 1931, and then a drop to under two million in 1936. Though economic factors such as the price of wool and mohair were partly responsible for this drop, widespread overgrazing which had taken place during the peak years was a contributory cause. Much of the report is therefore devoted to the effects of grazing on the original pasture and the analysis of pasture types. It is demonstrated that chiefly within the last twenty-five years the carrying capacity of vast areas of scrub vegetation has been reduced to half its original value by the incursion of an inedible Karroo bush as a result of over-grazing. Further serious losses have been caused by the loss of soil, often down to bare rock, and by the replacement of valuable species of grass by others of far less value. The remedial measures include, as usual in such cases, the limitation of stock, with a system of deferred grazing; and in addition a detailed programme is suggested for experiment on the effects of grazing in different conditions.

The report is made the more instructive by a number of small-sized photographs. A vegetation map, which resulted from the survey, and a map showing the reduction of stock from 1931 to 1936 are included, but as neither gives contours or names, the report should be read in conjunction with a general map of Basutoland, which may not always be available. There seems no advantage

in retaining the official foolscap for a report of this nature, which deserves a considerable circulation outside the government departments immediately concerned. E. B. W.

REPORT ON THE FISH AND FISHERIES OF LAKE RUKWA IN Tanganyika Territory and the Bangweulu region in Northern Rhodesia. By C. K. RICARDO. *London: Crown Agents for the Colonies*, (1939). 10×7 *inches; 78 pages; illustrations and sketch-maps.* 6*s*

Miss Ricardo began her zoological career by collaborating with Dr. Worthington in working on material collected by the expedition led by him to the East African lakes. She and Miss Janet Owen then visited other African waters, both to see for themselves and to add to the growing knowledge of the fisheries of our African dependencies. The report under review is based on a stay of six weeks on Lake Rukwa and four weeks in the Bangweulu region, and the recommendations it makes wisely include suggestions for the collection of further data. Nevertheless their opportunities were so well used, and the collections made were so well worked out, that the main outlines of a picture of the fish faunas and of the native and European fisheries of these two regions are now available. Details of water analyses are given in an appendix, and the zoology of the fishes has been treated in a technical manner elsewhere. The body of the report is written in non-technical language, a difficult task in which Miss Ricardo has so well succeeded as to shame minor criticisms. Keys for identification, illustrated by simplified line-drawings, should enable any one on the spot who can read to name any fish he may catch, and so to provide himself with the clue to all that is known about it. Miss Owen's photographs give a very good idea of the scenery and of native methods of fishing.

Such reports as this should make it possible for the knowledge of the settler and administrator on the one hand and that of the scientific worker on the other to reinforce each other, to the benefit of the African peoples. E. TR.

THE CAPE COLOURED PEOPLE, 1652–1937. By J. S. MARAIS. *London: Longmans, Green and Co.*, 1939. 9×5½ *inches;* xxii+296 *pages.* 12*s* 6*d*

This is an admirably lucid, scholarly, and readable survey of a difficult problem. The white man, as Mr. Marais reminds us, was an interloper, and he was unaware of the imminent dislocation and of the trouble hatching for posterity. In the course of white settlement, the Hottentot was dispossessed, the Bushman hunted down, slavery instituted, and the confusion still worse confounded by miscegenation. Mr. Marais traces the story with scrupulous care, documenting it at every point and not without a shrewd sense of its significance as an episode in the *comédie humaine*. Without moralizing, he follows the clash between conscience and self-interest and the perplexed drift in policy as the consequences of intrusion caught and constrained the settlers. It was not that they were worse than the rest of us: indeed Mr. Marais shows that even in the slave days the lot of the helots was on the whole lighter than in most slave-owning communities. But time brought its revenges, and the tussle between private interest and public justice complicated the position. In 1812 it was definitely laid down that before the law white and coloured were equal, and when in 1856 the Colony was granted self-government there was no legal obstacle to a man of colour entering parliament, though none has ever come thither. But after the Anglo-Boer War both Dutch and European in the old republics opposed the extension of the Cape franchise, and the British Government yielded to them. From 1930 to 1936 the voting powers of the Cape coloured folk have been further hedged about, while the balance in favour of the white

people has been weighted by the granting of the vote to all over the age of twenty-one. This is a work that merits careful reading by all interested in a vital question for civilization. J. P. R. W.

NORTH AMERICA

FROM INDIAN TRAIL TO IRON HORSE: travel and transportation in New Jersey, 1620–1860. By WHEATON J. LANE. *Princeton: Princeton University Press—Oxford: Humphrey Milford*, 1939. 9×6 *inches;* xviii+438 *pages; illustrations and maps.* 17*s*

Beginning with a short but excellent survey of the geographical factors, Mr. Lane has produced an account of the development of transport in New Jersey which is probably applicable to a much greater part of the United States; but the position of New Jersey, between New York and Philadelphia, makes it an ideal subject for such a study as this. If the earlier parts of the book (which are creditably free from the exaggerated romanticism of its title) are the more readable, it is perhaps because they are less overloaded than later pages with the crowded detail and documentation which are the current American scholastic virtues. They represent moreover Mr. Lane's most original contribution to the material for this work, and his account of the Indian trails contains such interesting information as that the pre-existence of these trails powerfully affected not only the directions taken by immigrant Europeans and the points at which they settled, but even, in some cases, the laying out of modern town streets. A history of the change in transport from such beginnings through the turnpike road and canal to the steamboat and railway of the nineteenth century must inevitably concern itself, to some extent, with sociology and economics and, in America no less than elsewhere, with politics too. Mr. Lane deals objectively and well with these related subjects; his narrative affords many glimpses at American life in Colonial days, and though his account of the jockeying for position in the lucrative transport corporations is not always edifying, it is often amusing.

The maps and illustrations are all excellent, and there is an adequate index. L. C. H.

SPANISH APPROACH TO PENSACOLA, 1689–1692. Translated, with introduction and notes by IRVING A. LEONARD. (Quivira Society Publications, vol. IX.) *Albuquerque: University of New Mexico*, 1939. 10×6½ *inches;* xvii +323 *pages; map. Subscription* $5.00

This collection of twenty-one documents vividly illustrates the tragic weakness of the Spanish Empire at the end of the reign of Charles II. It tells in detail the story of the abortive plan to colonize Pensacola Bay which preceded the weak settlement of that district in 1696.

Dr. Leonard, while working on the history of Florida, was fortunate enough to find some interesting documents and picturesque details which he considered deserved more extended treatment than had been possible in W. E. Dunn's study of 'Spanish and French rivalry in the Gulf Region of the United States, 1678–1702.' He also found an occasional pertinent document which had eluded Dunn, as for instance the copies of the Pez Memorial found in the Academia de Historia in Madrid and elsewhere. The other documents published in this volume were all in two bundles of papers in the Archivo General de Indias in Seville, and photostats of them had been deposited in the Florida State Historical Library, thanks to Miss Irene Wright who has done so much to make Spanish colonial documents available to American students.

The story which Dr. Leonard tells is one of interest not only to the geographer

studying the exploration of the northern shores of the Gulf of Mexico in the late seventeenth century, but also to the historian interested in the workings of the Spanish colonial system at a period when Spain was at her weakest. Fear of French aggression in the Gulf of Mexico led the Viceroy of New Spain to send out an expedition to reconnoitre the Gulf, and to support the plan for establishing a settlement at Pensacola Bay put forward by Don Andres de Pez. From 1689 till 1695 the Viceroy tried to interest the Spanish Government in the idea. He sent one expedition to explore the Bay by sea and another, under the Governor-elect of Florida, to explore it by land from the east. The famous creole cosmographer, Don Carlos de Sigüenza y Góngora, actually took part in the naval expedition, and Don Andres de Pez's fiery ambition to be made Governor of the new settlement, which he visualized as becoming the chief port of entry for New Spain, inspired the negotiations for six years. But the Court was too poor and too lacking in vitality to pursue any vigorous policy unless under compulsion. Nothing came of the project until a fresh threat from France galvanized the Spanish authorities into establishing a colony at Pensacola Bay, and by then the Viceroy was dead, Sigüenza y Góngora was mortally ill with the stone, and Admiral Pez under a cloud.

The story is typical of Spain under the later Hapsburgs, and is a valuably detailed study of a period and subject about which English-speaking students are too often content with hollow generalizations.

It is to be regretted that Dr. Leonard did not include a bibliography of the recent literature on the subject, and of the very rich collections of documents in the Spanish archives at Seville and elsewhere with which his historical introduction and notes show him to be familiar. J. O. M.

CENTRAL AND SOUTH AMERICA

WIRTSCHAFTSENTWICKLUNG UND LANDSCHAFTSWANDEL auf den westindischen Inseln Jamaika, Haiti und Puerto Rico. By WALTER GERLING. (Veröffentl. Inst. Amerikaforschung, Würzburg. I.) *Freiburg i. Br.: Carl Sintermann*, 1938. 9½×6 *inches; 262 pages; maps and diagrams*

It is now generally accepted that historical as well as geographical influences must be considered in explaining present-day landscapes. In this study the author has shown how, in the West Indian islands of Jamaica, Haiti, and Puerto Rico, which in general possess similar geographical features, the impact of different historical forces has produced contrasting landscapes. In Jamaica the Spaniards, disappointed in their search for gold and faithful to their exclusive colonial theory, took little interest in the island. Under early English rule, the introduction of slave labour and foreign capital, and the application of mercantilist theories, led to the establishment of great sugar estates, with scattered slave dwellings. Emancipation and external economic trends brought more variety into land utilization, but did not result to any large extent in the breaking up of estates. In Haiti, the policy of "national liberalism," which followed the extermination of French influence, established a system of small cultivators, now modified by the introduction of capitalistic monocultures. Spanish control of Santo Domingo was not relinquished until the end of the eighteenth century, and lack of capital retarded development until the invasion of American money in the second half of last century. On the other hand, Puerto Rico, owing to disturbances elsewhere, received a large influx of whites at the end of the eighteenth century, escaped the influence of French revolutionary ideas, and remained Spanish for another hundred years, ultimately to fall into the United States' colonial economy. The effect of these different histories on settlement,

cultivation, and land utilization are set out in detail. The author condemns strongly the mercantilist, liberal, and capitalist colonial policies, but refrains from proposing an acceptable substitute. G. R. C.

UNKNOWN TO THE WORLD: Haiti. By MABEL STEEDMAN. *London: Hurst and Blackett*, 1939. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 288 *pages; illustrations and map.* 12*s* 6*d*

DOCTOR'S OFFICE. By Dr. VINCENT TOTHILL. *London and Glasgow: Blackie and Son, Ltd.*, 1939. 8×5 *inches;* vi+288 *pages; illustrations and sketch-map.* 7*s* 6*d*

Miss Mabel Steedman's book on Haiti deserved something better than a catch-penny title and a blurb on the dust wrapper which holds out the attractions of "voodoo drums," "walking dead," and "the creeping horrors of the jungle," to explore which Miss Steedman "took her life in her hands." Actually, Miss Steedman did nothing of the sort. She would be the last person to suggest that she did. Here is a serious contribution to the literature of an island which, if not "unknown to the world," certainly has a smaller bibliography than most of the larger islands in the West Indies. Miss Steedman's intention has been to give an accurate and unbiased account of Haiti as it is to-day, and she has succeeded in doing do, in a blend of personal narrative and recorded fact. History, except for incidental reference, she leaves alone, and the student who desires more academic information than she provides in the main work will find valuable her ten appendices, dealing with health services, education, agriculture, public works, administration and finance. Half the book is devoted to a first-hand study of voodoo. In her quest for information on this subject Miss Steedman had some unusual experiences, and her temperate and sensible account of her investigations throws new light on a cult which has hitherto attracted journalistic extravagance.

Miss Steedman has no colour prejudice and formed a high opinion of the best men in the Negro republic. She leaves it to her readers to decide whether the Negro race can successfully compete with the white races in attaining a high degree of civilization; but Dr. Vincent Tothill appears to have little doubt that they can, and he deplores the scanty chances they have to show their true worth in Trinidad, where he practised among them for several years. He is a man of forceful opinions and strong sympathies, and is not afraid to express them. His remarks on conditions in Trinidad may not prove palatable to authority, but deserve to be examined with attention, particularly his strictures on the public health services. He writes with vehemence, inciseness, and humour. He has much to say—perhaps too much—about rum cocktails, and he discusses voodoo, sailing, missions, education, sugar estates and oil fields, and society in Trinidad. Lightly written though his book is, it has the serious implication of an honest man who knows what he is writing about. When discussing the island's future, he says, "You will find the inside of a Negro's mind inside his own house, just as you find an Englishman's, and until you get there you will never understand what he thinks about." He declares that the mass of people in Trinidad are peaceable folk who appreciate law and order, but would like to have "a law and order of their own making and a fair share in its administration." O. R.

WANDERINGS IN THE PERUVIAN ANDES. By Dr. A. M. RENWICK. *London and Glasgow: Blackie and Son, Ltd.*, 1939. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xii+228 *pages; illustrations and map.* 10*s* 6*d*

Dr. Renwick was for thirteen years principal of the Anglo-Peruvian College in Lima. The wanderings described in this volume are vacation trips, which took

him to many of the most famous sites of archaeological research in Peru, and through all the main types of Peruvian country from the coastal deserts to the moist tropical forest. Some of these journeys, such as that made by train from Mollendo over the Andes to Cuzco and Macchu Picchu, are habitually taken by tourists, and the natural and historic marvels of this route have been frequently described and figured before. Others led him to places less familiar but of almost equal inherent interest, such as Paramonga, Chavin de Huantar, and the Perene Colony.

Dr. Renwick's account of these travels is sincere and unexaggerated, but not nearly so comprehensive as the experiences he records. There is little in his descriptions of scenery, of plant and animal life, of natural products or of Indian customs that might not equally well have been written by any observant tourist. His comments on the ruins of ancient civilizations are influenced by a long acquaintance with the foremost archaeologists in Lima, and are detailed and interesting. The subjects best treated in the book are the history of the country during the bloodstained periods of the Conquest and the War of Liberation, and the descriptions of present-day life in Lima and in the provincial centres of Arequipa and Tarma.

There is a useful map, a short index, and a number of good photographs. These were not taken by the author, but obtained locally, and are not always relevant to the text. G. I. C.

AUSTRALASIA AND PACIFIC

A NEW GUINEA LANGUAGE BOOK. (Blanche Bay dialect.) Compiled by J. H. L. WATERHOUSE. *Sydney: Australasian Medical Publishing Co., Ltd. (for the Australian National Research Council)*, 1939. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 44 *pages*

This slender book represents ten years' study of the *tinata tuna* or Blanche Bay language, used by native tribes of what was known formerly as the Bismarck Archipelago. The author, with thirty years' experience of New Guinea languages behind him, has built upon the work of the late Rev. J. H. Margetts, has augmented the material, and produced the essentials of the language in a complete handbook. Anybody can master the construction of sentences by studying the 315 phrases aided by the simple grammar; and a good vocabulary is added. The book will be invaluable for all Europeans living in that part of New Guinea.

If Mr. Waterhouse succeeds in his wider object of making *tinata tuna* a substitute for the execrable pidgin English which is the *lingua franca* of the Mandated Territory of New Guinea, his benevolence will meet with even greater appreciation. In the territory of Papua the native language *motu* was adopted with that same object, but it was considered later that it was not rich enough to be an evolutionary implement. English is therefore taught in mission and Government schools. Malay is the esperanto of the entire Dutch territory. Perhaps in the future it may be possible for one language to be used over the whole island of New Guinea. L. E. C.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

A TEXTBOOK OF GEOMORPHOLOGY. By PHILIP G. WORCESTER. *London: Chapman and Hall, Ltd.*, 1939. 9×6 *inches;* viii + 565 *pages; illustrations, sketch-maps, and diagrams.* 22*s* 6*d*

There is a strong tradition among American geologists in the production of systematic, workmanlike, well-illustrated text-books on physical geography of the type familiar to generations of students in Salisbury's "Physiography." Professor Worcester's book is rigidly faithful to this tradition. It treats the

subject in the conventional order, beginning with an all-too-brief discussion on methods of representing relief and the place of the Earth in the solar system, proceeding thence to the materials of the lithosphere, weathering, erosion (normal, arid, glacial, and marine), volcanoes, islands, and coral reefs. Thus the emphasis, almost throughout, is laid on process rather than on the land-forms produced; the treatment is geological rather than geographical. Not until the last chapter (plains, plateaus, and mountains) are land-forms as such analysed, and these land-forms are of a sub-continental order of magnitude, by contrast with the third-order features described in the first fifteen chapters. In fact, although the title is geomorphology, the material is that which we are accustomed to call physiography and the author regards the terms as synonymous. But most geomorphologists will regret that he has ruled "out of order" a treatment of the major problems of the earth's plan, the distribution and relations of the continental blocks and ocean basins. Less than five pages in chapter 2 are devoted to this aspect, and, in consequence, the treatment is perfunctory in the extreme; Continental Drift is dismissed in half a page and Isostasy is not mentioned.

Within the field to which the author restricts himself the treatment is straightforward and clear, and the style is almost elementarily simple. The discussion of the land-forms of arid regions calls for special commendation, though the normal cycle betrays a less certain touch and the use of the term "maturity" is misleading. The book is printed on a heavy glazed paper which permits the reproduction of illustrations within the text. There are 375 of these photographs and well-executed line drawings, which simplify understanding and add greatly to the value of the work. The lists of references at the end of each chapter show a preoccupation with American literature which is justifiable in so far as the book will be used by American students, but the omissions will surely be regretted by European readers. A. A. M.

SOIL CONDITIONS AND PLANT GROWTH. By Sir E. JOHN RUSSELL. Seventh edition. (The Rothamsted Monographs on Agricultural Science. Edited by Sir E. J. RUSSELL.) *London: Longmans, Green and Co.*, 1937 (*first published in* 1912). 9×5½ *inches;* viii+656 *pages; illustrations.* 21*s*

The seventh edition of Sir John Russell's book has been largely re-written to include the results of recent research. Many of these the author has had the opportunity of discussing at first hand with workers in this country and in Europe, especially in Poland and Russia; and the book throughout reflects this close contact with the actual work of research. The first chapter consists of a vivid account of the history of soil investigation in relation to plant growth from classical times, through Boussingault's pioneer work of a hundred years ago to the modern period, in which the author and his colleagues at Rothamsted have played so prominent a part. The remaining seven chapters cover the whole field of soil science and agricultural practice, and are copiously illustrated with plates, diagrams, and tables. References to literature are given both as footnotes and in two selected bibliographies at the end of the volume. While this method of double citation has advantages, space might have been saved by confining all references to the appendices.

In his preface the author states that the purpose of the book is "to present the student with the broad outlines of the subject, including sufficient detail to give reality to the treatment but avoiding always the tediousness of the card-index record." This purpose is admirably carried through, and it is safe to say that there is no other work that can be so unreservedly recommended to all those wishing to obtain a balanced and up-to-date knowledge of the subject. J. S. L. G.

CARTOGRAPHY

A MAP OF OLD ENGLISH MONASTERIES AND RELATED ECCLESIASTICAL foundations, A.D. 400–1066. By ALICE M. RYAN. (Cornell studies in English, XXVIII.) *Ithaca, New York: Cornell University Press—London: Humphrey Milford,* 1939. 9×6 *inches;* vi+34 *pages; map.* 4*s* 6*d*

This map is designed to show ecclesiastical institutions and routes of communication between them from the end of the Roman period until the Norman Conquest. The pamphlet which accompanies the map contains a valuable twenty-page index, in which sites marked on it are arranged alphabetically under their Old English names, followed by the modern name and abbreviated references to early sources on the same lines as those used in the publications of the Place Name Society. There follows a five-page list of abbreviations used in the text. The map itself is in outline to a scale of about 24 miles to the inch. Separate symbols, rather too small to be distinctive, are used for monasteries, nunneries, double-monasteries, hermitages, cells, churches, and so forth. The only physical features shown are coastline and rivers, but Roman roads have been reproduced from the O.S. Map of Roman Britain, 1931.

Although their aims are different, comparison between the O.S. Map of Britain in the Dark Ages and Miss Ryan's map is inevitable. In choosing to cover a period of six hundred years she has perhaps limited the value of her labours to some extent, for two hundred years must have elapsed between the construction of the latest Roman roads and the development of monastic life in England, while reference to the index shows that many of the sites were not founded until as late as the tenth or eleventh centuries. Moreover the omission of physical features also militates against her aim in indicating communications, and makes it impossible to derive from her map a picture of the spread of Christianity. The eastern Lowlands were relatively early invaded and settled by pagan Saxons and Angles, as the distribution of cemeteries and early place-names in the O.S. map clearly shows. Here Christianity was extinct at a time when it was flourishing in the west.

The work however breaks new ground, and is to be welcomed as an interim report, which is all that it claims to be. We shall look forward to Miss Ryan's projected work on Scotland and Wales, Ireland and Brittany, and to the "more complete picture of the road-system" that is promised for a later edition. P. C.

MAP-READING FOR SCHOOLS. By MARGARET WOOD. *London: George G. Harrap & Co.,* 1939. 10×7½ *inches; 76 pages; illustrations, maps, and diagrams.* 4*s* 6*d*

This book is designed to assist pupils of School Certificate standard to use large-scale maps for pleasure and profit. The opening section explains the main principles of map-reading on somewhat stereotyped lines. More attention might have been drawn to the extent to which contours, unless carefully chosen, may give a too generalized impression of the topography, though the author emphasizes the necessity of considering them in relation to other indications of altitude. The various editions of the Ordnance Survey maps are described in detail: a few minor errors have been made, *e.g.* in the colour of the hachures on the Fifth (Relief) Edition, and on the point of origin of the grid system. It is unfortunate that of the three maps on various scales purporting to show the same area, one does not do so. The remainder of the book consists of eight studies, with extensive exercises, of particular areas of Great Britain, illustrating land forms and human activities. These are illustrated by portions of the relevant Ordnance Survey sheets and photographs. Without requiring an advanced knowledge of

geological structure or strata, the physical forms and their relation to settlement and communications are simply explained. The amount of information which may be gleaned from intelligent study of large-scale maps is well brought out, and the book should be of much assistance to all anxious to acquire a general understanding of maps. G. R. C.

ECONOMIC AND HISTORICAL GEOGRAPHY

TOOLS AND THE MAN. By W. B. WRIGHT. *London: G. Bell and Sons*, 1939. 9 × 5½ *inches;* xvi + 236 *pages; illustrations and maps.* 12*s* 6*d*

Neither the late Dr. Wright nor his publisher seem to have made up their minds as to what kind of reader would use this book. Chapter III devotes five pages to the dating of glacial and post-glacial times, and Chapter V gives four to the mammals of the Quaternary; Chapter XVI discusses the mode of life, physical types, and burial customs, and Chapter XVII deals with Late Palaeolithic art. These chapters seem to have been intended for the general public. On the other hand, one needs some knowledge of geology to appreciate the author's account of the terraces in the Somme and Thames valleys. In fact, Chapters X, XI, and XII constitute a solid core to the book. In Chapter XI there are brief descriptions of the various cave and other sites in Britain, from which implements have been obtained that can be correlated with definite phases of the Quaternary, while Chapter XII deals with zoning and correlation. Throughout his working life Dr. Wright's thoughts seem never to have been far from the Ice Age for long, and these three chapters contain the results of an investigation to which he gave a good deal of time during recent years: the correlation of the glacial periods and the palaeolithic cultures in several countries.

The author greatly loved a zone fossil. The Neolithic is the age of polished stone, and therefore he protested against the classifying of such cultures as the Ertebølle, and perhaps the Maglemose, in the Mesolithic. He believed that if archaeologists, who are often doubtful themselves, "will trust to their zonal fossils they will not be led far astray," though he recognized some of the dangers. Wright was not a man to shirk difficulties. He was careful to draw the reader's attention to the conflicting evidence for the age of the Recent Loess, and to the different histories of the Thames and Somme valleys during the Acheulian interglacial period.

The main results at which he arrived are that the Acheulian culture developed largely during the long interglacial (Mindel-Riss), and that the so-called Younger Drift of the north of England is to be correlated with the Little Eastern of Norfolk and Suffolk, the Riss of Alpine countries, the Saale of north Germany, and the Levalloisian solifluction of the Somme valley. He admitted some of the difficulties involved in this correlation, and suggested that the Upper Palaeolithic implements found in the Hunstanton boulder clay may come from rearranged surface material.

Wright's critical mind and his wide experience of glacial problems entitle his carefully considered opinion to the serious attention of prehistorians. It is a pity that the book could not have been wholly devoted to the main problem in which he was interested. R. U. S.

THE MONTHLY RECORD

DEVELOPMENT OF THE RHÔNE

The *Revue de Géographie Regionale*, Lyon, No. 1–3, 1939, contains papers read at the Scientific Congress of the Rhône held at Aix-les-Bains in June 1938. Details are given therein of the great hydroelectric barrage, said to be the largest in Western Europe, which is being built in the gorges of the Rhône at Génissiat, 7 kilometres south of Bellegarde. This work requires the diversion of the Rhône through two tunnels in the rock, in order to uncover 260 metres of the present bed for building the foundations of the barrage. For this purpose 20–25 metres of alluvium must also be removed. It is hoped to develop 416,000 kw. at the two power stations to be built on the banks. It is pointed out however that in the storage of large volumes of water in a calcareous area there must be considerable wastage. The complete scheme will require at least three years for its execution. The careful observations carried out on the regime of the Rhône, before the plans of the barrage were drawn up, are described in detail by M. Max Henry. Other papers deal with the meteorology, hydrology, and geology of the region, and a number are concerned with the Rhône as a commercial waterway. M. A. Desaunais gives a detailed account of trends during the last twenty-five years, and a warning against optimistic views on the future. The Rhône is unlikely to form an outlet for Central Europe to the Mediterranean; Strasbourg is well served by the Rhine, and in any case the Rhône–Rhine canal is not accessible to Rhône barges. Navigation is confined between Marseille, Chalon, and Sète, and transhipment is always necessary at Chalon or Lyon. The Rhône will never be important as a long-distance route; it serves to transport over short distances heavy materials between port, factory, and consumer. The riverine traffic is dominated by the port of Lyon, with 450,000 tons per annum, compared with 180,000 tons for the next port, Marseille. It is composed of constructional materials, largely for building the dykes (30 per cent.), petrol and oils (24 per cent.), and industrial products (14 per cent.). Railway competition has considerably reduced the traffic in agricultural products, coal, and minerals. M. Desaunais outlines the various proposals for overcoming the navigational difficulties of the river, and argues for control of the flow and riverbed between Lyon and Arles against the project of a lateral canal. Above Lyon however a canal is essential, but to secure full benefit of the river, it is necessary to establish control as far as Geneva, and this is one object of the Génissiat barrage.

THE YENISEI BASIN

The development in 1937 of the basin of the Yenisei is described by Professor G. B. Cressey in a paper contributed to the Denison University *Bulletin*, August 1939, a reprint of which we have received from the author. The area is chiefly comprised by the Krasnoyarsk Krai, an administrative unit established in 1934, with an area of 2·3 million square kilometres. The controlling factors, apart from the climatic, are the Trans-Siberian Railway, which crosses the Yenisei at Krasnoyarsk, and the Yenisei itself. Regular river services run during the open months between Yeniseisk, Krasnoyarsk, and Minusinsk, and between Krasnoyarsk and Igarka. The Northern Sea Route Administration maintains a fleet of planes, chiefly hydroplanes, and when the weather permits, there are daily flights between Krasnoyarsk and Igarka.

North of the W. Sayan mountains lies the Minusinsk basin, comprising three rolling lowlands of upper Devonian and Carboniferous formations. These are in part coal bearing, and one mine is producing at Chernogorsk. This area, free

from frost for two hundred days in the year, and having three months with an average temperature over 10° C., is primarily a grazing country. Despite the inadequate rainfall however cultivation is being extended, though severe wind erosion threatens the soils. There are few large settlements here apart from Minusinsk (25,000 inhabitants) and Abakan. The central agricultural area is served by the railway, settlements clustering in a narrow zone on each side. This area, transitional park land, has good soils and a rainfall of 16 inches. The temperature range is less than in the mountain basins, but there are less than three months with an average temperature of 10° C. Agriculture is fairly successful, wheat and oats predominating. Krasnoyarsk, which has grown rapidly in recent years to a population of 200,000, is the largest city on the river, owing its importance to its strategic situation on the only practicable route to the east. It has large railway repair and coach-building works, a flour mill with a daily capacity of 700 tons, paper, cement, and other works. The river here is open to navigation for 185 days in the year.

These two sections of the basin contain most of the population of the Krai, for of the total population of 1·8 millions about 95 per cent., predominantly Russian, are south of the Angara river in 58° N. To the north the sparse and small settlements lie along the river banks. Igarka, 15,000 inhabitants, on the northern edge of the taiga, owes its growth to the lumbering industry. Most of the timber is obtained from the Angara and its tributaries; but Igarka, on the northern edge of the taiga, is, for large vessels, the nearest protected anchorage to the Arctic Ocean, 400 miles to the north. The saw mills, employing 4000 workers, exported 90 million board feet of timber in 1937, some going as far as South Africa. Fresh vegetables are grown locally, but it is said that each hectare requires 100 tons of manure. The most northerly town on the river is Dudinka, the capital of the Taimir national okrug, with a population of 2500. It is linked by rail to Norilsk, where there are nickel and coal mines. To the east, near the mouth of the Khatanga river, oil and salt deposits are being developed.

The paper, based upon field observations by the author, also includes notes on the physiography of the region and on the regime of the Yenisei.

DR. LIVINGSTONE: A CONTRIBUTION TO THE EARLY HISTORY OF THE MOSQUITO NET

Mr. Robert Money kindly sends us this copy of a letter by Livingstone which is preserved in Helmsley Church, Yorkshire. It was written to Mrs. Gray, wife of the first Bishop in Cape Town, and mother of Canon Gray, who was for many years Vicar of Helmsley.

Shire Cataracts, 14 July 1863.

My dear Lady,

I feel exceedingly obliged by your kindness in making such a beautiful Mosquito curtain for me. Beyond a doubt it is the handsomest that ever appeared in this country, and I am a great admirer of the invention: this you will readily believe when I inform you that the greatest and most unaccountable folly of my life was travelling all over this Continent without ever once thinking that the pest could be escaped from. Philosophizing and thinking that we live in a state of interdependance and as other animals are sacrificed to our use so we must suffer a little for their enjoyment afforded the poorest consolation, and now I leave philosophy to them "get in near me if ye can" and laugh as they dash themselves against the meshes. Many thanks for your kindness. I start for the Lake to-morrow.

I am etc.

David Livingstone.

THE MALTESE EXPLORER, ANDREA DE BONO

In 1933 we called attention (*Geogr. J.* 82 (1933) 379) to a brochure written in Italian by a compatriot, the Rev. S. B. Galea, on the African traveller De Bono, whose achievements as the first explorer of the Sobat and the European who had advanced farthest on the upper Nile before the great lakes were reached by Speke and Baker, had not, he thought, been sufficiently recognized. He had been at some pains to bring together the scanty notices of the traveller that could be found. We have now received a slightly revised English version of the pamphlet, printed last year, with one or two additions consisting chiefly in the attention called to a passage relating to De Bono in Jules Verne's 'Five weeks in a balloon,' and further notes on the traveller's associate, supposed to be a nephew, variously spoken of as Hannibal or Amabile. A portrait of Andrea is also reproduced. One or two misprints in the original have escaped correction and the translation is not always quite accurate. De Bono was primarily a trader, and was not in very good odour with the English explorers in the same region, but he no doubt suffered for the misdeeds of his subordinates, and he deserves to be remembered as an enterprising pioneer on the Upper Nile. E. H.

AGRICULTURAL COLONIZATION IN THE PONTINE MARSHES AND LIBYA

In the paper by Sir John Russell, which appeared under the above title in the *Journal* for October 1939, Plate 2 has been wrongly ascribed: the view is of Sabaudia, and not of Littoria as stated.

JAN MAYEN

We have received from Mr. E. G. Bird, who visited the island in 1934 (*Geogr. J.* 85 (1935) 553–57), some comments upon the names used by Mr. King in his paper in the *Journal* for August 1939.

Referring to the List of Huts given by Mr. King (p. 127), Mr. Bird writes: "Haugen Hut. Mr. King prefers this name to our Camp Dobbel—the actual name painted on the hut (named after its builder Anders Anderson, commonly called 'Dobbel Anders'). Mr. King calls it 'Haugen's Hut' in translation of the Norwegian *Haugenhytta*. This is, of course, incorrect. *Haugen* is not the name of a person but is the Norwegian for 'the mound over a grave' and the hut in fact gets this name from a grave situated close behind it. The name must therefore be Haugen (not Haugen's) Hut." With this latter point Mr. King agrees; he adds however that none of the Norwegians, one of whom had spent several winters on the island, recognized the name Camp Dobbel.

Mr. Bird also points out that Camp Margarete lies in Ten Tents Bay, and not in Seven Hollander Bay. Camp Helene lies not to the north of Cape Traill, but nearly at the south-west extremity of the lava flow separating the sandy beach of Great Wood Bay proper from the sandy stretch running to Cape Traill (or about 1/16 inch north of the *a* of Stephan on the map facing p. 126 of the *Journal* for July 1939). Camp Olesbu, a hut on the sand about 1½ miles east of Rudson Cape, was omitted by Mr. King from his map; none of his party actually visited the hut, but viewed through glasses it appeared to be in a bad state of repair, with a hole in one corner of the roof.

Hock*k*stetter Crater should of course read Hoch*h*stetter Crater.

AN AMERICAN EXPEDITION TO THE ANTARCTIC

From time to time during the past year we have had reports of a proposed American expedition to the Antarctic. Details, sometimes conflicting, had

appeared in the press and elsewhere, but the first authoritative statement we have seen was published in the *Geographical Review* for January, and it is mainly upon this that the following summary is based.

In June last the United States Congress appropriated $350,000 for investigations in the Antarctic, and President Roosevelt created an Antarctic Service, with an executive committee representing the Navy Department and other government offices to coordinate and direct its activities. Admiral Byrd, as commander of the proposed expedition, was made an ex-officio member of this committee. According to the *Explorers Journal* (Summer 1939) Admiral Byrd and Mr. Lincoln Ellsworth had been called before Congressional Committees to give first-hand reports on their explorations and suggestions how the United States might best protect its rights in the Antarctic. "Tentative plans call for the surveying and mapping of all regions visited by American explorers since 1820." This note was accompanied by a sketch-map which shows the sector between 80° and 150° W. and the area in the interior of the Australian Antarctic Territory over which Ellsworth flew early last year as claimed by Byrd and Ellsworth for the United States.

The expedition hopes to continue some at least of the work of the two previous expeditions, and the programme was discussed at a conference, under the chairmanship of Dr. Isaiah Bowman, held by the National Research Council at Washington in July. Two bases will probably be established, one at Little America, "the other a thousand miles or more to the east of Little America at a point yet to be determined. The location of the second base will depend largely on ice conditions and accessibility to the continent as determined by the men on the spot. It is expected that considerable aerial survey work will be done." A thousand nautical miles along the parallel 75° S. is about 64° of longitude. The proposed second base would therefore be about 20° of longitude outside the western limit of the Falkland Islands Dependency.

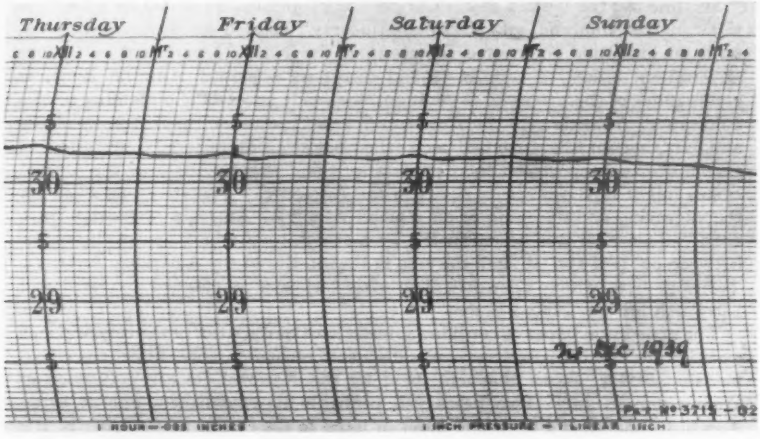
The expedition with a personnel of about 125 men and equipped with two aeroplanes and 160 dogs sailed on November 21 in the *North Star* and the *Bear of Oakland*. The equipment also included a "snow cruiser" designed by Mr. Thomas Poulter: this is a 27-ton motor fitted with caterpillar wheels 10 feet in diameter to negotiate crevasses. It will carry a small aeroplane, equipment, and sufficient stores to maintain a small party for a year.

The note in the *Geographical Review* concludes: "It is understood that one purpose of this expedition is to establish semi-permanent stations. It is to be noted that up to the present time the United States Government has not recognized any claims made in the Antarctic either by its own citizens or by foreign governments. It has however in its communications with foreign governments reserved all rights that it or its citizens may have in the Antarctic."

THE SEMI-DIURNAL VARIATION OF THE BAROMETER

In the tropics the semi-diurnal variation of the barometer is normally pronounced and regular, with an amplitude of about 0·1 inch, a principal maximum at 10^h and minimum at 16^h, with secondary maxima and minima at 22^h and 04^h respectively. In higher latitudes the amplitude is diminished, and except in stable anticyclonic weather the daily double oscillation is masked by much greater and irregular changes of pressure. But during the quiet settled weather, frosty and often foggy, which prevailed in London during the latter half of December and the early part of January, the semi-diurnal maxima were on many days conspicuously shown by the barograph mounted by the notice board at present standing in the Society's Museum, and were remarkably regular

during the week before Christmas. The trace for December 21–24 is here reproduced.



The cause of this double daily oscillation is not fully understood, but all the evidence points to its being a complicated thermo-dynamic effect involving the diurnal range of temperature, the rotation of the Earth, and a free oscillation of the atmosphere. It is not a gravitational effect: Professor Chapman has shown that the atmospheric tides produce a much smaller variation of pressure.

L. C. W. B.

FORMATION OF WIND SLABS

In a note published in the *British Ski Year Book*, vol. X., October 1939, Mr. G. Seligman states that he had opportunities when at the Jungfraujoch station during the summer of 1938 of watching wind slabs in course of formation. When the wind was in the right quarter, snow would be carried in a compact cloud by a single gust down the lee slope of the Sphinx ridge, decreasing all the time in magnitude till it was no longer visible. In other words, snow was being deposited on the lee slope in the manner the author has described in various works. It is regretted that some continental writers continue to spread the fallacy that wind slabs are formed by snow being pressed on to the windward side of ridges.

In the same note Mr. Seligman furnishes measurements made at the Jungfraujoch of the settling of both snow and firn. He found that not only was this settling very rapid, and continuous at depths down to 5 or 6 feet, but that in old firn 18 feet deep settling was still taking place. The hollow found under wind slabs is attributed in part to the settling of soft snow, whereby it is drawn away from the more rigid slab.

A GIFT OF ATLASES TO LEEDS UNIVERSITY

Mr. Harold Whitaker, known for his exhaustive catalogues of the maps of Yorkshire and Lancashire (to be followed by a volume on Cheshire), has in the course of his studies brought together an interesting collection of early atlases, maps, and road books, which he is now presenting to the Leeds University Library, though the greater number will remain in his custody for the present.

The principal contents of the collection are described in a note by the University Librarian, Mr. R. Offor. They include not only English atlases like those of Saxton, Speed, Camden, and Ogilby, but a good number of important foreign examples, such as the fine works of Münster, Mercator, Hondius, Jansson, and Blaeu, which contain maps of England and its counties, some being represented by more than one edition. Speed is well to the fore with six editions, beginning with the first (1611) and including the rare one of 1646, which seems not to be in the British Museum and was apparently unknown to Chubb. It is a reissue of Humble's edition of 1627 with the text reset. Of important county atlases of later dates, Cary's are represented by eleven editions. Special atlases, such as those relating to inland navigation and railways, also find a place. For a private collection it is unusually complete of its kind, and students in the north of England will certainly find it of great service when finally housed at Leeds. Even now Mr. Whitaker is glad to show what is in his keeping to persons interested. E. H.

DRAKE'S PLATE OF BRASS

In the *Journal* for June 1938 we published an account by Dr. J. A. Williamson of the discovery in 1936, at Corte Madera Creek in the Bay of San Francisco, of a piece of brass presumed to be that set up in 1579 by Francis Drake when he visited the coast of California during his circumnavigation of the globe. Dr. Williamson suggested that analysis of the metal would show whether the brass was modern, and the owners of the plate, the University of California, subsequently published through the California Historical Society the results of an analysis by Messrs. Fink and Polushkin, under the title "Drake's Plate of Brass authenticated." Commenting upon this report (in the *Journal* for July 1939), Dr. Hume-Rothery concluded that the title was not justified; though it had been shown clearly that the plate itself was not obviously modern, there was room for further detailed examination. Photographs of the plate were included in the account of the analysis, and the Keeper of Western Manuscripts, Bodleian Library, pointed out that it was impossible to authenticate the plate by comparison with contemporary lettering. The inscription given below had already appeared in the *Journal*, accompanying Dr. Williamson's account, and we have since received from Mr. F. J. Varley the following comments upon its form:

1 BEE IT KNOWNE VNTO ALL MEN BY THESE PRESENTS
2 IVNE.17.1579.
3 BY THE GRACE OF GOD AND IN THE NAME OF HERR
4 MAIESTY QVEEN ELIZABETH OF ENGLAND AND HERR
5 SVCCESSORS FOREVER I TAKE POSSESSION OF THIS
6 KINGDOME WHOSE KING AND PEOPLE FREELY RESIGNE
7 THEIR RIGHT AND TITLE IN THE WHOLE LAND VNTO HERR
8 MAIESTIES KEEPEING. NOW NAMED BY ME AN TO BEE
9 KNOWNE VNTO ALL MEN AS NOVA ALBION.
10 FRANCIS DRAKE

The first line is a translation of the Latin exordium common in legal deeds, such as bonds and appointments, in the forms:

Pateat universis per presentes
Noverint universi per presentes } quod ego/nos

A contemporary translation of these would be:

Be yt known unto all men by these presents that I/we . . .

The additional *e* in "Bee" and "knowne" is suspicious, as is the unknown

form "herr." The date, apart from the peculiar form, is misplaced; in a genuine document it invariably comes at the end. There is no "that" to connect lines 2 and 3.

"By the Grace of God *and*" is a meaningless line: "Dei gratia" properly belongs to the title of Queen Elizabeth in line 4. The Queen however was never referred to by the title here used: either her full title was given or she is referred to as "the Queen's Majesty."

In line 5 the "I" is misplaced: in a genuine document the name of the reciter would come first, with a description of who he was, and the reciter would subscribe to it, with the testifications if necessary.

As far as lines 6, 7, 8 are concerned, for a composition which purports to take a legal form, the language employed is not to be paralleled in any legal document of the period. "Resigne their right and title in the whole land" is suspiciously like a recital of the narrative account of Drake's annexation. The argument that this is a proof of authenticity is a strange one.

Finally, the repetition of "to bee knowne unto all men" is peculiar. Why should "Nova Albion" be used in line 9, instead of "New Albion"?

Mr. Varley concludes that the inscription on the plate appears to be a farrago of translations from legal Latin, strung together in an unintelligent manner and based upon the narrative of the annexation. In his opinion internal evidence would condemn it as a forgery.

MEETINGS: SESSION 1939–40

Seventh Meeting, 8 January 1940. The President in the Chair

Elections: Erling Johan Fredrik Clausen; Jack Davies, B.A.; Roger Casalis de Pury; Eric Alfred Heffer; Miss A. P. M. Lynam; Alexander Melamid; Gerald Samson; Francis Waldron; James Wreford Watson, M.A.; The Reverend Robert Whaites; Flight-Lieut. Arthur Joseph Young, R.A.F.

Paper: Tali and the Burma–Yunnan road. By Mr. Patrick Fitzgerald

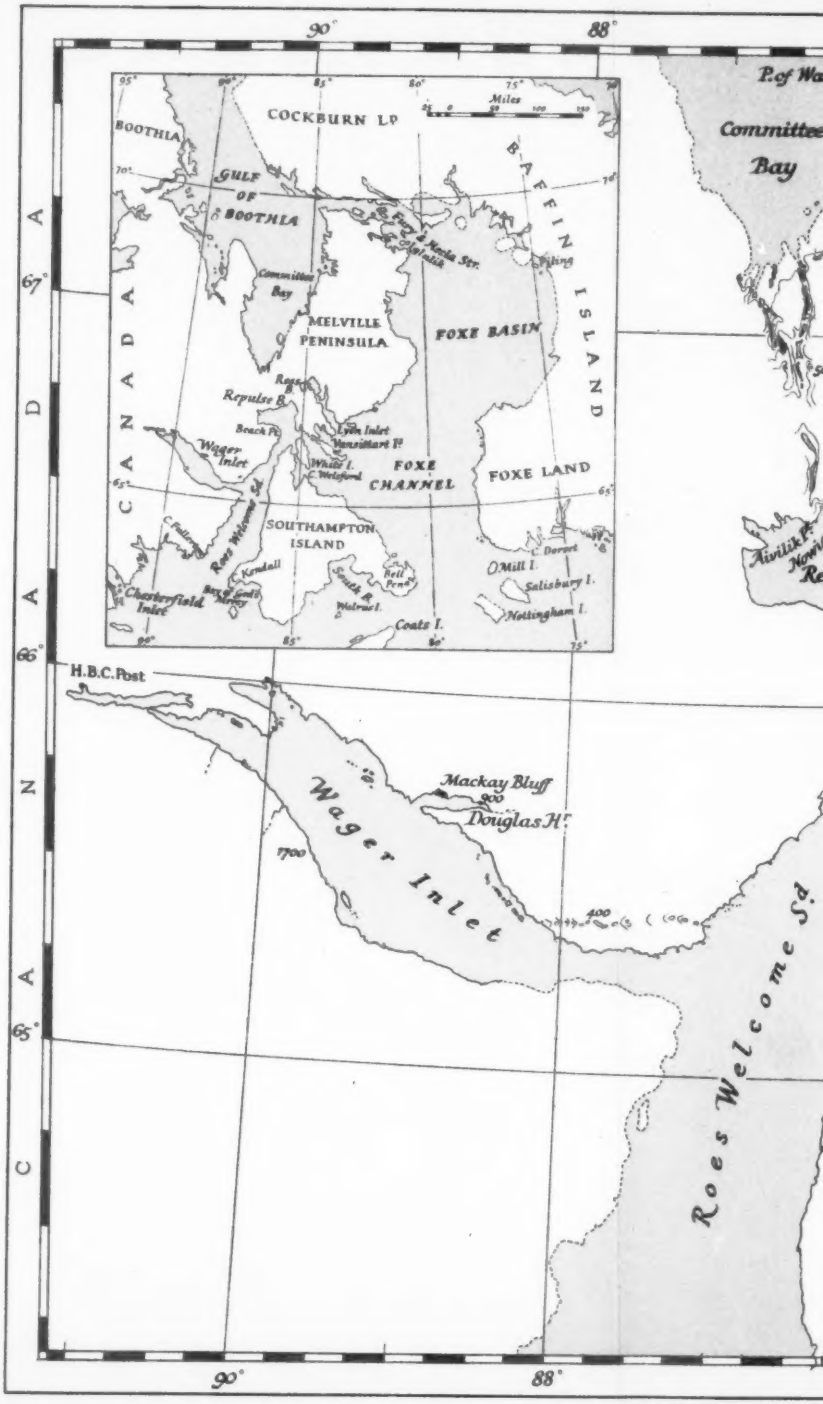
Eighth Meeting, 15 January 1940. Lord Moyne, Vice-President, in the Chair

Paper: Geographical aspects of Jewish settlement east of Germany. By Miss H. G. Wanklyn

Ninth Meeting, 22 January 1940. The President in the Chair

Elections: A. E. Ballard; Mrs. G. F. Hotblack; Sahibzada Muhammad Yusuf Khan; Sub-Lieut. Penryn V. Monck, R.N.

Paper: Indians of the northern Andes. By Mr. John Hanbury-Tracy



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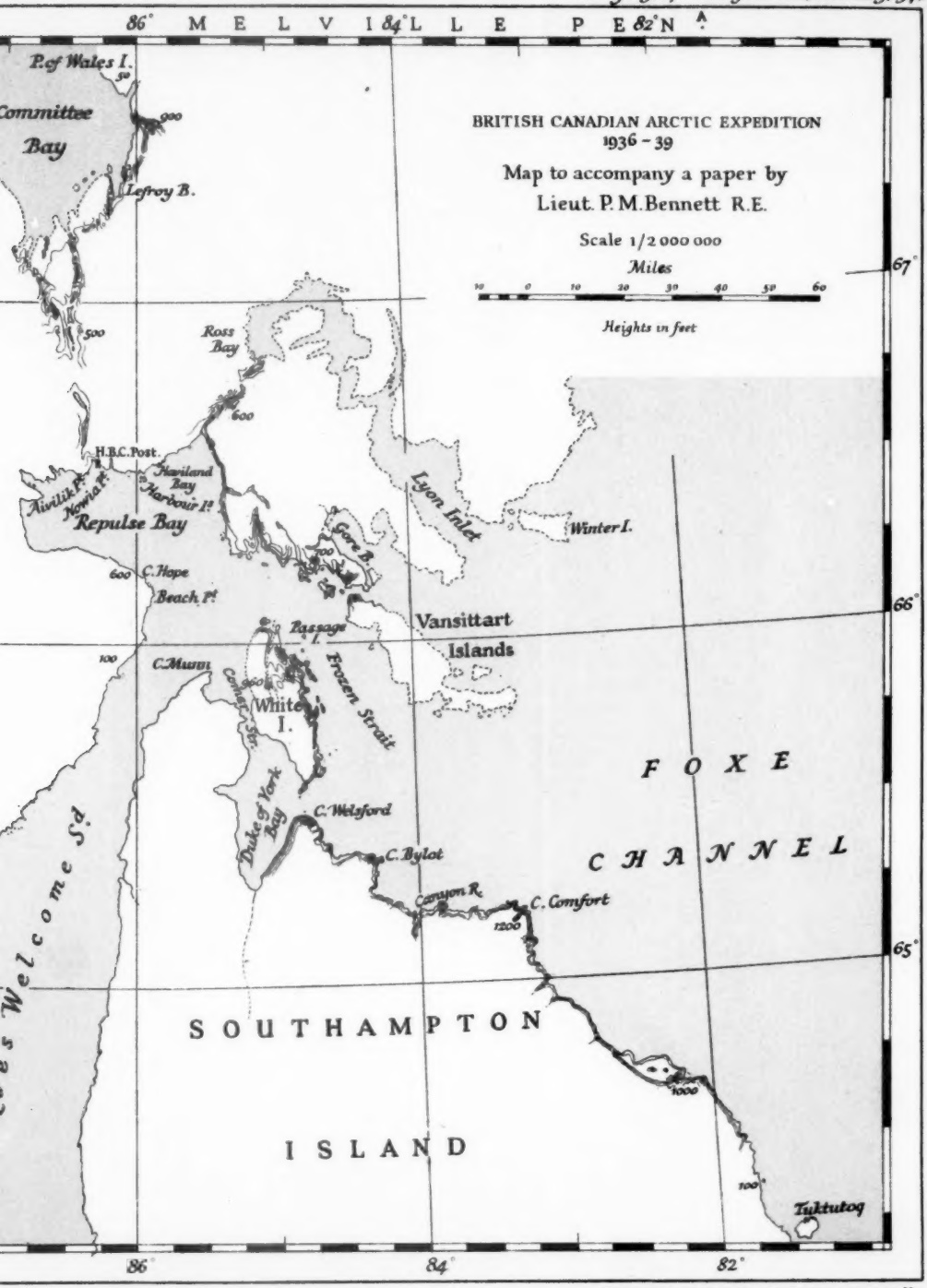
86° M E L V I L L E P E N 84° 82° N
BRITISH CANADIAN ARCTIC EXPEDITION
1936 - 39
Map to accompany a paper by
Lieut. P. M. Bennett R.E.
Scale 1/2 000 000
Miles
10 0 10 20 30 40 50 60
Heights in feet
67°
66°
65°
P. of Wales I.
Committee Bay
Lefroy B.
Ross Bay
H.B.C. Post
Hurd Bay
Harbour Pt
Repulse Bay
Lyon Inlet
Winter I.
Gore B.
C. Hope
Beach Pt
Passage I.
Vansittart Islands
C. Muvvi
White I.
Frozen Strait
Duke of York Bay
C. Welsford
C. Bylot
Canyon R.
C. Comfort
FOXE CHANNEL
SOUTHAMPTON ISLAND
Welcome Sd.
Tuktutoq
500
600
100
1200
1000